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ABSTRACT

This course of study provides a framework for the content of a program in trade and industrial education as part of the Alabama vocational education program. The course of study was designed to assist educators in developing and maintaining high quality vocational programs and to ensure uniformity of vocational programs. Following a description of the framework for trade and industrial education, the guide lists topics and required student outcomes for core courses in the trade and industrial program: automotive body repair, automotive technology, building construction, cabinetmaking and millwork, carpentry, commercial art, computer electronics, cosmetology/barbering, diesel technology, electricity, electronics, graphic arts, heating, air conditioning and refrigeration, maintenance technology, major appliance repair, masonry, plumbing, precision machining, sheet metal, small engine repair, technical drafting, upholstery, and welding. Notes on cooperative education and vocational student organizations complete the guide. (KC)

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# Alabama Course of Study

# TRADE AND INDUSTRIAL EDUCATION

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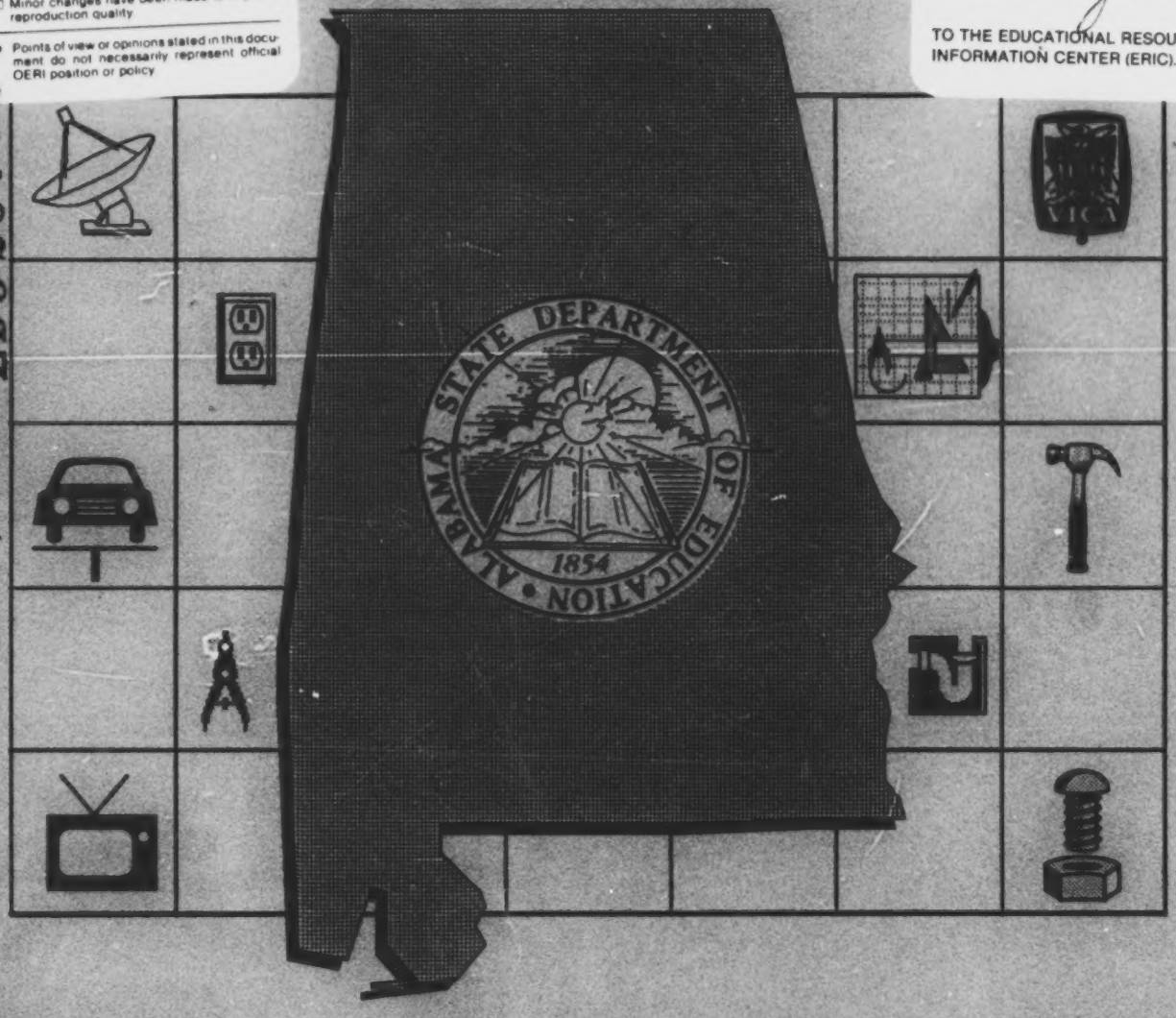


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**BULLETIN 1990, NO. 57**

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# Alabama Course of Study
# TRADE AND INDUSTRIAL EDUCATION

**Wayne Teague**
**State Superintendent of Education**
**ALABAMA STATE DEPARTMENT OF EDUCATION**
**MONTGOMERY, ALABAMA 36130**
**BULLETIN 1990, NO. 57**

ALABAMA COURSE OF STUDY
TRADE AND INDUSTRIAL EDUCATION

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# PREFACE

Federal legislation mandates that vocational education programs provide a coherent sequence of courses that include exploration of careers, understanding of basic family concepts, and preparation for employment.

Alabama Law, Act No. 84-234 in section 16-35-4 states:

> The state board of education, on the recommendations of the state superintendent, shall prescribe the minimum content of courses of study for all public, elementary and high schools in the state....

This course of study provides the framework for the content of a course and/or program in vocational education. The primary purpose of the course of study is to assist administrators and teachers in developing and maintaining high quality vocational programs that produce employable students with entry-level job competencies and students with basic familiy living skills. A secondary purpose is to add uniformity to vocational programs.

The core courses in this document contain student outcomes that meet the five characteristics of any course of study: basic, appropriate, reachable, reasonable, and enforceable. The outcomes dictate the content that is to be used in planning effective and comprehensive vocational programs.

The course of study is a foundation for each vocational education program. Local school systems are encouraged to add content to accommodate varying local patterns of organization, resources, and needs.

## INTRODUCTION

Trade and Industrial Education programs at the secondary school level are designed to provide comprehensive instruction in occupational skills and to develop attitudes and work habits through the use of facilities and equipment which simulate industry. Trade and Industrial Education programs prepare students for entry-level employment and advancement within occupations. Technical instruction is provided in classroom and laboratory facilities for a minimum of two class periods each day. Programs are established based upon the needs of students and upon employment opportunities within a community.

Cooperative Training programs differ from the laboratory-type program in that students receive instruction in their selected occupation through an on-the-job training situation. The teacher-coordinator of a Cooperative Training program works with employers to develop training plans for students that will include experiences designed to develop entry-level employment skills. These occupational skills are coordinated with a study of related technical information in the classroom. Students enrolled in these programs attend one-hour related study classes daily and are employed for at least three hours during the regular school day.

Opportunities to develop and apply leadership, social, civic, and business-related skills are provided through Vocational Industrial Clubs of America (VICA), the vocational student organization for Trade and Industrial Education students. As an integral part of the trade and industrial program, VICA activities enhance classroom instruction. These activities directly relate to the student outcomes of the Trade and Industrial Education program.

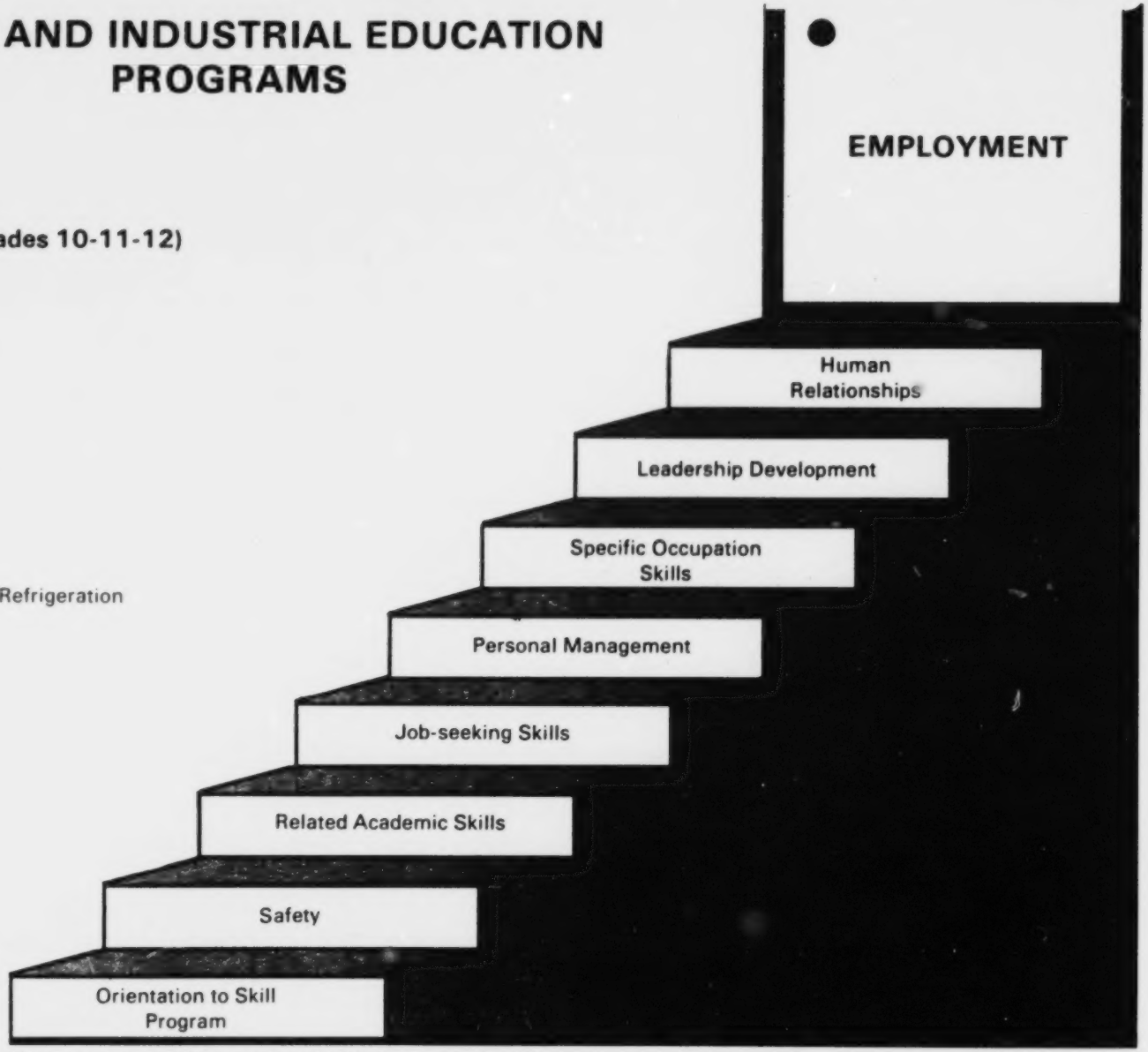
## CONCEPTUAL FRAMEWORK FOR TRADE AND INDUSTRIAL EDUCATION

The following page illustrates the programs offered in Trade and Industrial Education, Grades 10 through 12. Twenty-three core program areas are listed on the illustration. There are eight common areas that contain skills which lead to employment. These skills are not sequenced due to the varied nature of each trade program.

# TRADE AND INDUSTRIAL EDUCATION PROGRAMS

## CORE PROGRAMS (Grades 10-11-12)

Automotive Body Repair
Automotive Technology
Building Construction
Cabinetmaking and Millwork
Carpentry
Commercial Art
Computer Electronics
Cosmetology/Barbering
Diesel Technology
Electricity
Electronics
Graphic Arts
Heating, Air Conditioning, and Refrigeration
Maintenance Technology
Major Appliance Repair
Masonry
Plumbing
Precision Machining
Sheet Metal
Small Engine Repair
Technical Drafting
Upholstery
Welding




(Steps are not arranged in any sequenced order.)

*Concepts mandated by State Board of Education resolution are to be infused in all programs.

## STATEMENT OF DELIMITATIONS

This course of study is a document limited to minimum requirements and job component core courses. Requirements are expressed in terms of student outcomes. The competency-based outcomes are minimum. They may be expanded at the school or system level to meet the community needs and business and industry requirements.

The course of study is not intended to be used as a curriculum guide and does not include learning activities. Curriculum guides that include activities, teaching methods, resources, and student evaluations may be developed at the state, system, and/or school level.

While attempts were made to review current literature and research pertaining to curriculum development nationwide, student outcomes will need to be updated as new occupations and technologies emerge.

This course of study is designed to give teachers the flexibility to rearrange outcomes to meet student instructional needs.

TRADE AND INDUSTRIAL EDUCATION

AUTOMOTIVE BODY REPAIR

This course provides classroom and shop experience in most phases of the repair of damaged auto bodies. It includes instruction in metal straightening by hammering; smoothing areas by filling, grinding, and/or sanding; concealment of imperfections; and replacement of body parts and components, such as upholstery, trim, and glass. Also included are instruction and training in the use of manuals, price lists, and flat-rate manuals; record-keeping; and shop safety.

The CIP Code for Automotive Body Repair is 470603.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | |
| ORIENTATION TO SKILL PROGRAM | 1. Discuss purposes, rules, and regulations relative to the skill program. |
| RELATED ACADEMIC SKILLS | 2. Demonstrate proficiency in academic skills as related to the skill program. |
| JOB-SEEKING SKILLS | 3. Complete job applications, develop résumés, and participate in job interviews. |
| PERSONAL MANAGEMENT | 4. Demonstrate personal management skills.<br>- Budgets<br>- Credit applications<br>- Insurance |
| LEADERSHIP DEVELOPMENT | 5. Demonstrate leadership, citizenship, work ethics, and patriotism. |
| HUMAN RELATIONSHIPS | 6. Develop satisfactory relationships with co-workers and employers. |

TRADE AND INDUSTRIAL EDUCATION

AUTOMOTIVE BODY REPAIR

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| HUMAN RELATIONSHIPS (continued) | 7. Identify areas of personal improvement.<br>- Attitudes<br>- Appearance<br>- Goals |
| SAFETY | 8. Apply safety rules and procedures.<br>- Personal<br>- Shop<br>- Fire<br>- Electrical<br>- Equipment |
| OXYACETYLENE CUTTING AND WELDING | 9. Light and adjust cutting torch.<br>10. Lay out and burn straight cuts in mild steel. |
| BASIC PANEL REPAIR | 11. Rough out and align steel and aluminum panels.<br>12. Fill and finish depressed areas.<br>13. Repair rusted areas. |
| ADVANCED PANEL REPAIR | 14. Remove and replace body components.<br>- Bolt-on panels<br>- Doors<br>- Hoods<br>- Deck lids<br>- Bumpers<br>- Energy absorbers |
| TRIM, ACCESSORIES, AND HARDWARE | 15. Align panels.<br>- Energy absorbers<br>- Doors<br>- Hoods<br>- Deck lids<br>- Bumpers |

TRADE AND INDUSTRIAL EDUCATION

AUTOMOTIVE BODY REPAIR

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| TRIM, ACCESSORIES, AND HARDWARE (continued) | 16. Remove, replace, and align body components.<br>- Trim panels<br>- Moldings<br>- Weather stripping<br>- Door locks and mating parts<br>- Hood latch and parts<br>- Window regulators and parts |
| PAINTING AND REFINISHING | 17. Sand, clean, and condition metal surfaces for undercoat and color coat.<br>18. Mask sections and parts.<br>19. Apply finishes.<br>- Color coats<br>- Undercoats<br>20. Clean and compound painted surfaces.<br>21. Prepare plastic components for refinishing.<br>22. Refinish plastic components.<br>23. Remove and apply decals and stripes.<br>24. Perform exterior and interior clean-ups. |
| ELECTRICAL SYSTEMS | 25. Remove and replace system components.<br>- Battery<br>- Fuses<br>- Bulbs<br>- Switches<br>- Headlights<br>- Flashers |

TRADE AND INDUSTRIAL EDUCATION

AUTOMOTIVE BODY REPAIR

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| ELECTRICAL SYSTEMS (continued) | 26. Charge battery. |
| | 27. Adjust headlights. |
| ESTIMATING | 28. Complete a parts, material, and labor estimate. |

TRADE AND INDUSTRIAL EDUCATION

AUTOMOTIVE TECHNOLOGY

This course provides classroom and shop experiences in automotive maintenance and repair work. It includes training in the use of diagnostic and testing equipment, technical manuals, and a variety of hand and power tools. Instruction and practice are given in the diagnosis of malfunctions; disassembly of units; parts inspection and repair; engine overhaul and/or repair; ignition systems, carburetion, brakes, transmissions, front-end alignment, heating, ventilation, and air conditioning; and a variety of accessories.

The CIP Code for Automotive Technology is 470064.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| ENGINE OPERATIONS | 9. Identify the components of the engine and define their functions.<br>10. Disassemble and reassemble engine block, including precision measurements.<br>11. Disassemble, recondition, and reassemble cylinder head.<br>12. Identify, remove, renew, or replace fuel system components.<br>- Fuel tank<br>- Fuel pump<br>- Fuel filter<br>13. Identify ignition system components.<br>14. Test ignition system components.<br>15. Remove and replace distributor ignition system components.<br>16. Test and set initial ignition timing and advance mechanism. |

TRADE AND INDUSTRIAL EDUCATION

AUTOMOTIVE TECHNOLOGY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| ENGINE OPERATIONS (continued) | 17. Remove and replace exhaust systems. |
| | 18. Identify lubrication system components and engine oils. |
| | 19. Test engine oil pressure. |
| | 20. Change oil and oil filters. |
| | 21. Identify cooling system components and coolants. |
| | 22. Test cooling system components. |
| | 23. Remove and replace cooling system components.<br>- Air<br>- Liquid |
| POWER TRAIN | 24. Identify major components of the power train and define their purposes.<br>- Clutches<br>- Transmissions<br>- Drive lines |
| | 25. Remove and replace components of rear wheel drive vehicles.<br>- Drive shafts<br>- Universal joints<br>- Center bearings and hangers<br>- Transmissions (automatic and manual)<br>- Clutch assemblies |

TRADE AND INDUSTRIAL EDUCATION

AUTOMOTIVE TECHNOLOGY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| POWER TRAIN (continued) | 26. Remove and replace components of front wheel drive vehicles.<br>- Drive shafts<br>- C.V. joints<br>- Transaxles (automatic and manual)<br>- Clutch assemblies |
| | 27. Adjust shift linkage.<br>- Automatic<br>- Manual |
| | 28. Adjust clutches.<br>- Manual<br>- Hydraulic |
| | 29. Remove and replace hydraulic clutch components. |
| | 30. Service transmissions. |
| | 31. Identify parts of differential and types of lubricants. |
| | 32. Remove and replace rear wheel drive components.<br>- Axles<br>- Seals<br>- Bearings |
| BRAKES, STEERING, SUSPENSION, AND ALIGNMENT | 33. Identify the relationship among suspension, steering, and alignment. |
| | 34. Explain the purpose of brake systems. |
| | 35. Perform a visual inspection of brake system components. |
| | 36. Perform operational brake tests. |

TRADE AND INDUSTRIAL EDUCATION

AUTOMOTIVE TECHNOLOGY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| BRAKES, STEERING, SUSPENSION, AND ALIGNMENT (continued) | 37. Remove and replace brakes.<br>- Pads<br>- Shoes |
| | 38. Measure and machine brake drums and rotors. |
| | 39. Remove, rebuild, and replace brake cylinders.<br>- Wheels<br>- Caliper<br>- Master |
| | 40. Replace brake hoses, steel lines, and fittings. |
| | 41. Remove and replace brake valves.<br>- Proportioning<br>- Pressure differential<br>- Combination |
| | 42. Flush and bleed brake systems. |
| | 43. Identify and inspect steering and suspension components. |
| | 44. Inspect, rotate, and balance tire and wheel assemblies. |
| ELECTRONIC SYSTEMS | 45. Define electrical terms.<br>- Volts<br>- Amperes<br>- Ohms<br>- Watts<br>- Direct current |
| | 46. Identify insulators and conductors. |

TRADE AND INDUSTRIAL EDUCATION

AUTOMOTIVE TECHNOLOGY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| ELECTRONIC SYSTEMS (continued) | 47. Read meter scales. |
| | 48. Measure volts, ohms, and amperes. |
| ELECTRICAL SYSTEMS | 49. Locate and identify circuit problems.<br>- Open<br>- Short |
| | 50. Strip and splice electrical wires. |
| | 51. Identify the uses of electricity to operate and maintain an automobile. |
| | 52. Inspect battery condition. |
| | 53. Load test a battery. |
| | 54. Service or clean battery, post, and cable connections. |
| | 55. Remove and replace battery cables. |
| | 56. Charge battery. |
| | 57. Test charging systems.<br>- Alternator<br>- Voltage regulator<br>- Wiring |
| | 58. Remove and replace alternator. |
| | 59. Test starter control. |
| | 60. Test starter amperage and voltage drop. |
| | 61. Remove and replace starter solenoid. |

TRADE AND INDUSTRIAL EDUCATION

AUTOMOTIVE TECHNOLOGY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| ELECTRICAL SYSTEMS (continued) | 62. Test, remove, and replace electrical breakers.<br>- Fuses<br>- Circuit breakers<br>- Flasher units |
| HEATING, VENTILATION, AND AIR CONDITIONING | 63. Explain the purposes of the components of a basic air-conditioning system.<br>64. Perform a visual inspection of heating and air-conditioning systems.<br>65. Perform an operational test of heating and air-conditioning systems. |

TRADE AND INDUSTRIAL EDUCATION

BUILDING CONSTRUCTION

This comprehensive course focuses on basic instruction and practical experience in essential elements of Building Construction. These elements include carpentry, cabinetmaking, masonry, plumbing, and electrical wiring.

The CIP Code for Building Construction is 460499.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| BLUEPRINT READING | 9. Identify architectural building symbols. |
| | 10. Determine dimensions from a blueprint. |
| | 11. Interpret building specifications. |
| | 12. Sketch working drawings. |
| BUILDING SITE PREPARATION | 13. Install batter boards. |
| | 14. Locate and square building corners. |
| | 15. Set grade stakes. |
| CONCRETE FORMS | 16. Construct concrete forms.<br>- Footing<br>- Slab |
| | 17. Align and brace foundation forms. |
| FLOOR FRAMING | 18. Lay out a floor frame. |
| | 19. Cut and install floor framing components.<br>- Sill plates<br>- Joists<br>- Subfloor |

TRADE AND INDUSTRIAL EDUCATION

BUILDING CONSTRUCTION

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| WALL FRAMING | 20. Lay out and construct wall framing components.<br>- Wall frames<br>- Corner posts<br>- T-posts |
| | 21. Frame, align, and install wall components.<br>- Exterior coverings<br>- Partition walls<br>- Structural sheathings<br>- Window and door frames |
| ROOF AND CEILING | 22. Cut and install roof and ceiling components.<br>- Ceiling joists<br>- Common rafters<br>- Roof decking<br>- Roof felt<br>- Asphalt composition shingles |
| EXTERIOR FINISHES | 23. Install exterior materials.<br>- Sheathing<br>- Exterior siding<br>- Cornice<br>- Trim |
| INTERIOR FINISHES | 24. Install interior components.<br>- Drywall board<br>- Plywood paneling<br>- Interior doors<br>- Trim and molding |
| STAIR CONSTRUCTION | 25. Lay out, cut, and install stair components.<br>- Straight-run stringer<br>- Risers and treads |

TRADE AND INDUSTRIAL EDUCATION

BUILDING CONSTRUCTION

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| OPERATING POWER EQUIPMENT | 26. Inspect, clean, and operate power equipment.<br>- Table saw<br>- Radial arm saw<br>- Drill and drill press<br>- Jointer<br>- Planer<br>- Band saw<br>- Router<br>- Shaper<br>- Belt sander |
| FASTENING AND FINISHING | 27. Drill and bore holes in stock.<br>28. Fasten stock with glue and clamps.<br>29. Fasten stock with nails, staples, screws, and bolts.<br>30. Fill and finish holes.<br>31. Sand surfaces for finishing. |
| CASEWORK, DESIGN, AND LAYOUT | 32. Estimate materials from a blueprint or layout.<br>33. Sketch a project. |
| APPLYING VENEER AND LAMINATE | 34. Lay out, cut, trim, and apply veneer and laminate. |
| CUTTING AND SHAPING CASEWORK COMPONENTS | 35. Cut and shape casework components.<br>- Face frame stiles and rails<br>- Top and bottom panels<br>- Partitions<br>- Shelf panels<br>- Toe board and back panel<br>- Casework top or countertop and backsplash<br>- Drawer front, sides, back, and bottom<br>- Doors |

TRADE AND INDUSTRIAL EDUCATION

BUILDING CONSTRUCTION

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| ASSEMBLING AND INSTALLING CASEWORK COMPONENTS | 36. Assemble casework components.<br>- Face frames<br>- Panels<br>- Toe boards<br>- Base<br>- Drawers<br>- Casework doors<br>- Shelving<br>- Hardware |
| MASONRY | 37. Mix mortar.<br>38. Set up mortar boards and place mortar.<br>39. Bond a block wall.<br>40. Spread mortar.<br>41. Lay a stretcher course to the line. |
| PLUMBING | 42. Cut steel pipe with hacksaw and pipe cutter.<br>43. Thread steel pipe using three-way dies and ratchet dies.<br>44. Bend copper tubing using lever-type bender.<br>45. Flare copper tubing.<br>46. Cut copper tubing and pipe using hacksaw and tubing cutter.<br>47. Clean copper tubing and pipe. |

TRADE AND INDUSTRIAL EDUCATION

BUILDING CONSTRUCTION

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| PLUMBING (continued) | 48. Construct copper joints.<br>- Solder<br>- Compression<br>49. Cut plastic pipe using handsaw and hacksaw.<br>50. Construct plastic pipe joints.<br>- Solvent weld<br>- Polyethylene<br>51. Hang pipe using pipe strap.<br>52. Make measurements.<br>- End-to-center<br>- Center-to-center<br>- Fitting allowances<br>53. Rough-in fixtures.<br>- Soil stacks<br>- Trap arms for bathtubs<br>- Stack vents<br>- Kitchen sinks<br>- Washing machines<br>54. Test a drainage system with the water method.<br>55. Install a clean-out.<br>56. Rough-in water supplies.<br>- Lavatories<br>- Kitchen sinks<br>- Tank-type water closets<br>- Bathtubs and showers<br>- Washing machines |

TRADE AND INDUSTRIAL EDUCATION

BUILDING CONSTRUCTION

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| RESIDENTIAL WIRING | 57. Install and wire circuits.<br>- Single-pole<br>- Three-way<br>- Four-way |
| | 58. Install and wire a duplex receptacle outlet circuit. |
| | 59. Install and wire a special purpose receptacle outlet circuit. |
| | 60. Install a service entrance main panel. |
| | 61. Install a service entrance meter base. |

TRADE AND INDUSTRIAL EDUCATION

CABINETMAKING AND MILLWORK

This course involves classroom and shop experiences in layout, fabrication, assembly, installation, and repair of structural units. Instruction emphasizes care and use of hand and power tools, equipment, and materials; common systems of frame construction and principles involved; and drafting, blueprint reading, applied mathematics, and materials estimating.

Specialized classroom and practical work experiences are concerned with moldings, trim, and panels and with making such products as furniture, store fixtures, kitchen cabinets, and office equipment. Instruction includes cutting, shaping, and assembling parts by hand tools and wood working machines; finishing; installing hardware; planning layouts; reading blueprints; sketching; and using various materials.

The CIP Code for Cabinetmaking and Millwork is 480703.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| HAND TOOLS | 9. Identify and use hand tools.<br>- Lay-out tools<br>- Boring tools<br>- Edge-cutting tools<br>- Tooth-cutting tools<br>- Assembling tools |
| POWER EQUIPMENT | 10. Set up and use power equipment.<br>- Table saw<br>- Radial arm saw<br>- Drill press<br>- Jointer<br>- Planer<br>- Bandsaw<br>- Molder<br>- Belt<br>- Disc sander<br>- Shaper |

TRADE AND INDUSTRIAL EDUCATION

CABINETMAKING AND MILLWORK

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| CASEWORK DESIGN AND LAYOUT | 11. Interpret a basic blueprint. |
| | 12. Sketch a project. |
| CUTTING AND SHAPING CASEWORK COMPONENTS | 13. Lay out and cut casework components.<br>- Face frames<br>- Top and bottom panels<br>- Bottom frame<br>- Shelves<br>- Toe board<br>- Back panel<br>- Doors<br>- Drawer sides, back, bottom, and front<br>- Openings in counter top |
| ASSEMBLING AND INSTALLING CASEWORK COMPONENTS | 14. Assemble and install case work components.<br>- Face frames<br>- Panels<br>- Shelves<br>- Bottoms<br>- Drawers<br>- Doors<br>- Drawer guides<br>- Hardware |
| FINISHING SURFACES | 15. Prepare surfaces for finishing.<br>- Sanding<br>- Filling<br>- Staining<br>- Applying finish |
| APPLYING LAMINATE | 16. Apply laminate using adhesives. |
| | 17. Trim laminate edges. |
| | 18. Clean surface of laminates. |
| INSTALLING CASEWORK | 19. Install, trim, and secure casework. |

TRADE AND INDUSTRIAL EDUCATION

CARPENTRY

This course provides classroom and shop experiences in layout; fabrication; and assembly, installation, and repair of structural units. Instruction emphasizes the care and use of hand and power tools, equipment and materials, common systems of frame construction and principles involved, drafting, blueprint reading, applied mathematics, and estimating of materials.

Specialized classroom and practical work experiences address the installing of components, such as window frames, moldings, trim, and panels; erecting wood framework; installing doors; building stairs; building forms; and constructing roofs. Instruction also includes training in cutting, shaping, and assembling parts by means of hand tools and wood-working machines; planning layouts; reading blueprints; sketching; and using various materials.

The CIP Code for Carpentry is 460201.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| HAND TOOLS | 9. Identify and use hand tools.<br>- Layout tools<br>- Boring tools<br>- Edge-cutting tools<br>- Tooth-cutting tools<br>- Assembling tools |
| POWER EQUIPMENT | 10. Use power equipment.<br>- Circular saw<br>- Sabre saw<br>- Reciprocating saw<br>- Drill<br>- Power plane<br>- Pneumatic nailers and staplers<br>- Miter saw<br>- Table saw<br>- Radial arm saw |

TRADE AND INDUSTRIAL EDUCATION

CARPENTRY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| CUTTING, SHAPING, AND FASTENING | 11. Cut stock to size. |
| | 12. Crosscut dimensional lumber to size. |
| | 13. Rip cut dimensional lumber to size. |
| | 14. Bore holes. |
| | 15. Fasten stock.<br>- Nails<br>- Screws |
| | 16. Build saw horses. |
| BUILDING SITE PREPARATION | 17. Install batter boards. |
| | 18. Locate and square building corners. |
| | 19. Set grade stakes. |
| CONCRETE FORMS | 20. Construct forms.<br>- Footing<br>- Slab |
| | 21. Align and brace foundation forms. |
| FLOOR FRAMING | 22. Layout a floor frame. |
| | 23. Cut and install floor framing components.<br>- Sill plates<br>- Box sills<br>- Girders<br>- Floor joists<br>- Joist bridgings<br>- Subfloor |

TRADE AND INDUSTRIAL EDUCATION

CARPENTRY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| WALL FRAMING | 24. Lay out a wall frame. |
| | 25. Cut and install wall framing components.<br>- Corner posts<br>- T-posts<br>- Door frames<br>- Window frames |
| | 26. Frame and align partitions. |
| | 27. Install structural sheathing. |
| BLUEPRINT READING | 28. Identify architectural building symbols. |
| | 29. Determine dimensions from blueprints. |
| | 30. Interpret building specifications. |
| | 31. Sketch working drawings. |
| MATERIALS AND ORDERING | 32. Select lumber and materials.<br>- Framing<br>- Finishing |
| ROOF AND CEILING FRAMING | 33. Cut and install roof and ceiling components.<br>- Joists<br>- Rafters<br>- Bracing |
| | 34. Install roof decking. |
| ROOFING | 35. Apply roof felt paper. |
| | 36. Install asphalt composition shingles. |

TRADE AND INDUSTRIAL EDUCATION

CARPENTRY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EXTERIOR FINISHING | 37. Cut and install exterior components.<br>- Sheathing<br>- Siding<br>- Molding |
| INTERIOR FINISHING | 38. Cut and install interior components.<br>- Plywood paneling<br>- Solid wood paneling<br>- Drywall board<br>- Molding |
| STAIR CONSTRUCTION | 39. Lay out a straight-run stringer.<br>40. Lay out, cut, and install stair components.<br>- Straight-run stringer<br>- Risers and treads |

TRADE AND INDUSTRIAL EDUCATION

COMMERCIAL ART

This course focuses on specialized learning experiences that include theory, laboratory, and shop work as they relate to the design and execution of the layouts and making of illustrations for advertising, displays, and all types of printed material. Instruction includes advertising theory, preparation of copy, lettering, poster design, fashion illustration, silk screen, air brush and touchup, inks and color dynamics, package and product design, drawing for line and halftone reproduction, and other display devices and exhibits. Instruction leads to preparation for various types of employment, such as fashion illustrator, technical illustrator, advertising artist, and commercial artist.

The CIP Code for Commercial Art is 480203.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| BASIC DRAWINGS--BLACK AND WHITE TECHNIQUES | 9. Draw three cubes showing a different perspective for each.<br>10. Draw three basic forms using perspective fundamentals.<br>Examples: human hand, a tool, paper sack, pine cone, a flower<br>11. Prepare two drawings using negative space.<br>12. Draw a still life depicting light and shade.<br>13. Draw a still life using charcoal.<br>14. Draw a landscape in black and white.<br>15. Draw the human body.<br>- Two natural positions<br>- Motion |

TRADE AND INDUSTRIAL EDUCATION

COMMERCIAL ART

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| **BASIC DRAWINGS--BLACK AND WHITE TECHNIQUES (continued)** | 16. Draw the human figure in proportion using contour lines. |
| | 17. Draw and shade the human figure. |
| | 18. Prepare a pen-and-ink drawing. |
| | 19. Draw with wash using half tones. |
| | 20. Prepare three drawings illustrating ancient and classical architecture. |
| | 21. Illustrate the three orders of Roman columns by pen-and-ink drawings. |
| | 22. Prepare pencil drawings illustrating current architecture.<br>- Roman Classicism<br>- Style of 1800<br>- Modern |
| | 23. Design and illustrate the exterior of a house. |
| **BASIC DESIGN** | 24. Identify and use the elements and principles of design. |
| | 25. Create art designs by applying compositional proportions of the Golden Mean. |
| | 26. Identify and use value in creating art designs |
| | 27. Perform exercises in color using the Munsell Color Wheel. |
| | 28. Identify and use color-chords in creating art designs. |

TRADE AND INDUSTRIAL EDUCATION

COMMERCIAL ART

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| BASIC DESIGN (continued) | 29. Create a comprehensive layout for a poster to advertise an entertainment or public service function using the design theme of contrast, dominance, informal balance, and unity. |
| | 30. Create a modern heraldic design.<br>- Personal logo or trademark<br>- Company and/or corporation logo or trademark<br>- Public service<br>Examples: zoo, symphony orchestra |
| | 31. Create a comprehensive layout of a record cover using the design theme of harmony, graduation, formal balance, and unity. |
| LETTERING, TYPOGRAPHY | 32. Hand-letter letters in proportion and size from Roman, Gothic, and Decorative face styles. |
| | 33. Hand-letter letters in condensed, expanded, or Italic form. |
| | 34. Letter-space and word-space letters. |
| | 35. Construct type-face styles.<br>- Roman<br>- Gothic<br>- Decorative |
| | 36. Sketch variations of letters. |
| | 37. Type a manuscript for copy fitting. |

TRADE AND INDUSTRIAL EDUCATION

COMMERCIAL ART

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| LETTERING, TYPOGRAPHY (continued) | 38. Proofread and specify ("spec") manuscript. |
| | 39. "Spec" copy to fit allotted span. |
| LAYOUT AND DESIGN | 40. Create improved advertising layouts by analyzing layouts from current periodicals. |
| | 41. Create a trademark or logo for an existing company. |
| | 42. Design a direct mail and handout advertising brochure bi-fold in full color. |
| | 43. Design a full-page travel advertisement for a national magazine in full color. |
| | 44. Design an outdoor billboard, in proportion, using dull color and mixed media. |
| | 45. Design a black-and-white newspaper advertisement for a food condiment. |
| | 46. Create a silk screen design for printing on T-shirts and/or sweat shirts. |
| | 47. Silk screen a decorative automobile tag. |
| | 48. Create a full-color illustration of a classic automobile using an airbrush. |
| | 49. Create a full-color technical illustration of a piece of machinery using an airbrush. |

TRADE AND INDUSTRIAL EDUCATION

COMMERCIAL ART

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| LAYOUT AND DESIGN (continued) | 50. Create a package design for a pre-selected product including construction of the actual package or box. |
| | 51. Create a suitable design for office and/or stationery items.<br>Examples: letterheads, forms, business cards, envelopes |
| MECHANICS | 52. Make a simple paste-up. |
| | 53. Proofread a galley proof using proofreader's marks. |
| | 54. Make a rough layout and demonstrate point systems. |
| | 55. Make a simple paste-up and mount several type specimens to determine typeface legibility. |
| | 56. Make a rough layout and mount several type specimens for identification of common type sizes. |
| | 57. Make a rough layout to demonstrate factors in selecting typefaces.<br>Examples: legibility, color, weight |
| | 58. Prepare an overlay to be used on a simulated color plate. |

TRADE AND INDUSTRIAL EDUCATION

COMMERCIAL ART

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| MECHANICS (continued) | 59. Prepare a market display advertisement using a head portrait.<br><br>Examples: aftershave, perfume, mouth-wash, toothpaste, curlers |
| PRINTMAKING | 60. Convert a linear design to a relief block suitable for printing.<br><br>61. Prepare a relief block for printing.<br><br>62. Make a fine print run from a relief block.<br><br>63. Clean and prepare a recently used relief block for storage.<br><br>64. Prepare a silkscreen frame to accept a stencil.<br><br>65. Prepare a glue stencil for serigraphy.<br><br>66. Prepare a cut-film stencil for one-color serigraphy.<br><br>67. Prepare a silkscreen ink mixture for printing.<br><br>68. Make a fine print run of a one-color design.<br><br>69. Clean and prepare a recently used silkscreen for storage. |
| ILLUSTRATION--COLOR TECHNIQUES | 70. Create a geometric-shaped, dull-colored illustration.<br><br>- Opaque paint<br>- Construction paper glue-downs |

| MODULES | STUDENT OUTCOMES |
|---|---|
| ILLUSTRATION--COLOR TECHNIQUES (continued) | Students will<br>71. Create a realistic abstract form by drawing, coloring, cutting out, and mounting shapes.<br>72. Create a collage composition from assorted cut-outs.<br>73. Illustrate a 500-word story in a collage.<br>74. Illustrate a 150-word children's storybook.<br>75. Illustrate a jacket cover for a book, record jacket, or stereo tape cover.<br>76. Construct a color wheel.<br>77. Construct color charts depicting color theory and harmony.<br>78. Paint a drawing or illustration with transparent water color.<br>Examples: moist cakes, acrylics<br>79. Create a permanent opaque painting using egg tempera on a wooden board.<br>80. Create a permanent oil painting from an original sketch.<br>81. Depict a ninth century style illustration using hot wax technique. |

TRADE AND INDUSTRIAL EDUCATION

COMMERCIAL ART

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| ILLUSTRATION--COLOR TECHNIQUES (continued) | 82. Draw the likeness of different faces using various mediums.<br>- Charcoal and white chalk<br>- Pencils<br>- Pastel chalk<br>- India ink |
| INTERIOR DECORATING--FASHION DESIGN AND DISPLAY | 83. Create fabric sampler using labeled grids for a variety of mediums to complement specific fabrics. |
| | 84. Draw the six basic folds of clothing and fabric in relationship to drapery. |
| | 85. Create, design, and execute a colored wardrobe. |
| | 86. Create a miniature fashion display. |
| | 87. Design a fashion layout. |
| | 88. Create a drawing of an elongated female using ink and/or chalk. |
| | 89. Create a drawing of a male using wash and/or line. |
| | 90. Design an advertising layout for a fashion figure. |
| | 91. Trace a layout using pencils and ink. |
| | 92. Create an action split-unit poster. |
| | 93. Create a back-to-school advertisement for a clothing store. |

TRADE AND INDUSTRIAL EDUCATION

COMMERCIAL ART

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| INTERIOR DECORATING--FASHION DESIGN AND DISPLAY (continued) | 94. Execute drawings in anatomical proportion.<br>Examples: actions, sexes, ages |
| | 95. Sketch five-minute water-color illustrations.<br>Example: sports action figures |
| | 96. Create an opaque-color rendering of exaggerated chroma and values to compensate for photo loss in color reproduction. |
| | 97. Construct to architectural specifications a floor plan in ink. |
| | 98. Draw a room in one-point and two-point perspective. |
| | 99. Draw to perspective a series of 15 well-known furniture pieces. |
| PHOTOGRAPHY | 100. Determine the correct exposure settings for an average studio set-up. |
| | 101. Load 35mm film into a daylight developing tank. |
| | 102. Mix chemicals for processing black-and-white film. |
| | 103. Develop film to produce standard negatives. |
| | 104. Set up chemical trays for print processing. |
| | 105. Process exposed printing paper. |

TRADE AND INDUSTRIAL EDUCATION

COMMERCIAL ART

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| PHOTOGRAPHY (continued) | 106. Print a proof sheet for a roll of 35mm black-and-white film. |
| | 107. Make a test print and determine correct exposure time for an enlargement print. |
| | 108. Compose and print an enlargement. |
| SIGN PAINTING | 109. Construct squares and rectangles on large surface having no parallel reference lines. |
| | 110. Lay out and print sign using show-card colors and casual script.<br>- Banners<br>- Cards |
| | 111. Lay out and letter a trunk using a pounce pattern. |
| | 112. Lay out and letter a window with gold bronze. |
| PORTFOLIO | 113. Write a résumé. |
| | 114. Letter freehand both letters and numerals. |
| | 115. Draw two black-and-white drawings. |
| | 116. Produce a color design using any medium, subject, or style. |
| | 117. Produce a brochure for the current commercial art program. |
| | 118. Construct a package in color using type lifts. |

TRADE AND INDUSTRIAL EDUCATION

COMPUTER ELECTRONICS

This course deals with specialized areas of study in the operation and/or application of hardware and software, as well as the installation, servicing, repair, and maintenance of microprocessor and/or microcomputer equipment. Instruction in programmable controls, such as robotics, pneumatics, and hydraulics, is also included.

The CIP Code for Computer Electronics is 470104.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| INTRODUCTION TO COMPUTERS | 9. Outline the history of computers. |
| | 10. Connect Central Processing Unit (CPU) devices. |
| | 11. Perform computer maintenance. |
| | 12. Perform upgrading procedures. |
| OPERATING SYSTEMS | 13. Maintain disks and files. |
| | 14. Execute DOS commands.<br>- Internal<br>- External |
| | 15. Create subdirectories. |
| COMMERCIAL APPLICATION SOFTWARE | 16. Execute commercial application software.<br>- Word processing<br>- Spreadsheets<br>- Database software<br>- Desktop publishing |
| PROGRAM DEVELOPMENT | 17. Develop programs using machine and programming languages. |
| | 18. Design and execute programs. |

TRADE AND INDUSTRIAL EDUCATION

COMPUTER ELECTRONICS

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| PROGRAMMABLE CONTROLLERS | 19. Identify and demonstrate programmable controller capabilities. |
| | 20. Load and execute a program in a programmable controller to perform a specific function. |
| | 21. Perform maintenance on a programmable controller. |
| ROBOTICS | 22. Identify and discuss robot demands and applications in industry. |
| | 23. Identify and explain programming methods for robots. |
| | 24. Identify and explain robot interface devices. |
| HYDRAULIC SYSTEMS | 25. Explain theory of operation of hydraulic systems. |
| PNEUMATICS | 26. Explain theory of operation of pneumatic systems. |
| | 27. Interpret and/or troubleshoot pneumatic systems using schematics in a programmable controller to perform a specific function. |

## TRADE AND INDUSTRIAL EDUCATION

## COSMETOLOGY/BARBERING

Cosmetology/Barbering is the scientific and practical study of beauty culture with instruction in the care and beautification of the hair, skin, and nails. Practical skills and related knowledge are taught through laboratory experiences. Instruction in practical skills includes care of nails, scalp, skin, and hair; hair styling; cutting; and chemical services. Subjects include personal development, sanitation, safety, anatomy, electricity, chemistry, and salon and/or shop management. Instruction is designed to prepare students for the licensing examination.

The CIP Code for Cosmetology is 120403; for Barbering, it is 120402.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| GROOMING, POISE, AND PERSONALITY | 9. Demonstrate the principles of personal development.<br>- Hygiene<br>- Good grooming<br>- Posture<br>- Poise<br>- Personality |
| PROFESSIONAL ETHICS | 10. Demonstrate ethical conduct. |
| BACTERIOLOGY | 11. Identify types and classifications of bacteria.<br>- Sources of infection<br>- Defense against infection |
| STERILIZATION AND SANITATION | 12. Perform wet and dry sanitizing procedures. |
| SHAMPOOING | 13. Perform shampooing procedures.<br>- Draping<br>- Shampooing<br>- Rinsing |
| | 14. Demonstrate scalp and hair care. |

TRADE AND INDUSTRIAL EDUCATION

COSMETOLOGY/BARBERING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| HAIR SHAPING | 15. Give a basic haircut.<br>- Section<br>- Scissor<br>- Razor<br>- Clipper<br>- Over-curly hair<br>- Hair thinning |
| FINGERWAVING | 16. Fingerwave a complete head of hair. |
| HAIRSTYLING | 17. Identify facial shapes.<br>18. Perform shapings.<br>- Forward<br>- Reverse<br>- Diagonal<br>- Vertical<br>- Horizontal<br>19. Perform pin curl waves.<br>- Skip<br>- Vertical<br>- Diagonal<br>20. Perform hair styling.<br>- Pin curls<br>- Roller curls<br>- Blow dryer<br>- Curling iron<br>- Comb and brush |
| WIGS | 21. Distinguish between synthetic and human hair wigs.<br>22. Clean, condition, and block a wig.<br>23. Shape, set, and style a wig. |

TRADE AND INDUSTRIAL EDUCATION

COSMETOLOGY/BARBERING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| PERMANENT WAVING | 24. Give a permanent wave.<br>- Preparing patron<br>- Identifying chemicals<br>- Sectioning<br>- Blocking<br>- Wrapping<br>- Processing<br>- Neutralizing<br>- Observing safety precautions |
| HAIR COLORING AND LIGHTENING | 25. Perform predisposition test.<br>26. Color hair.<br>- Temporary<br>- Semi-permanent<br>- Permanent<br>27. Perform hair lightening.<br>- Virgin<br>- Retouch<br>- Toner<br>- Toner retouch<br>- Highlight<br>28. Perform corrective hair coloring. |
| CHEMICAL HAIR RELAXING AND BLOWOUT | 29. Perform chemical relaxation.<br>- Virgin<br>- Retouch<br>- Blowout<br>30. Give a soft curl permanent. |
| HAIR PRESSING AND THERMAL CURLING | 31. Give a thermal press.<br>32. Give a thermal curl. |

TRADE AND INDUSTRIAL EDUCATION

COSMETOLOGY/BARBERING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| MANICURING AND PEDICURING | 33. Give a manicure. |
| | 34. Give a pedicure. |
| NAILS AND DISORDERS OF NAILS | 35. Identify the parts, various shapes, and growth of the nails. |
| | 36. Describe the disorders of nails. |
| FACIALS | 37. Give a facial.<br>- Plain<br>- Application of day, evening, and corrective makeup |
| SKIN AND DISORDERS OF SKIN | 38. Describe the structure of skin. |
| | 39. Identify disorders of the skin. |
| HAIR AND DISORDERS OF HAIR | 40. Describe hair structure and growth. |
| | 41. Perform hair analysis. |
| | 42. Define hair diseases and disorders of the scalp and hair.<br>- Contagious<br>- Noncontagious |
| | 43. Give scalp and hair treatments. |

TRADE AND INDUSTRIAL EDUCATION

COSMETOLOGY/BARBERING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| ANATOMY | 44. Identify the structure and functions of the various systems of the body.<br>- Skeletal<br>- Muscular<br>- Nervous<br>- Vascular<br>- Circulatory<br>- Excretory<br>- Digestive<br>- Endocrine<br>- Respiratory |
| ELECTRICITY AND LIGHT THERAPY | 45. Identify electrical system practices.<br>46. Perform light therapy. |
| CHEMISTRY | 47. Apply knowledge of chemistry related to cosmetology and barbering services. |
| FACE SHAVING | 48. Prepare and shave a face. |
| MUSTACHES AND BEARDS | 49. Trim and shape mustache and beard. |
| SHOP AND/OR SALON MANAGEMENT | 50. Establish and operate a beauty salon and/or barber shop.<br>- Business administration procedures<br>- Business law<br>- Telephone etiquette<br>- Proper First Aid |

## TRADE AND INDUSTRIAL EDUCATION

## DIESEL TECHNOLOGY

Diesel Technology is a course that provides classroom and shop experiences in most phases of repair work on diesel equipment. It includes instruction and practice in the diagnosis of malfunctions; disassembly of engines and examination of parts; repair and adjustment of fuel injection systems, generators, governors, and auxiliary and accompanying power units; and the uses of technical manuals, a variety of hand and power tools, and testing and/or diagnostic equipment.

The CIP Code for Diesel Technology is 470605.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | **Students will** |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| ENGINES | 9. Remove, inspect, renew, or replace engine components.<br>- Cylinder head<br>- Cylinder block<br>- Cylinder sleeve<br>- Pistons, rings, and pins<br>- Main and rod bearings<br>- Crankshaft and camshaft<br>- Piston and rod assembly<br>- Seals and gaskets<br>- Oil pump and pan<br>- Valve train mechanism<br>- Intake and exhaust manifolds |
| | 10. Install engine in vehicle. |
| | 11. Replace fuel filters. |
| LUBRICATING SYSTEMS | 12. Inspect and service oil cooler. |
| | 13. Remove and replace oil filter. |
| COOLING, INTAKE, AND EXHAUST SYSTEMS | 14. Service water pump, fan, pulley, and belts. |
| | 15. Service radiator and shutter. |
| | 16. Check thermostat and shutterstat. |

TRADE AND INDUSTRIAL EDUCATION

DIESEL TECHNOLOGY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| COOLING, INTAKE, AND EXHAUST SYSTEMS (continued) | 17. Inspect and service air cleaner. |
| | 18. Check and service complete exhaust system. |
| ELECTRICAL SYSTEM | 19. Remove, clean, test, and install battery. |
| | 20. Charge the battery. |
| | 21. Test electrical circuits.<br>- Charging<br>- Starting<br>- Lighting |
| POWER TRAINS | 22. Adjust free travel on clutch pedal. |
| | 23. Remove and replace clutch assembly. |
| | 24. Remove and replace transmissions.<br>- Automatic<br>- Manual |
| | 25. Remove, inspect, renew, or replace power train components.<br>- Universal joints<br>- Shaft splines<br>- Center bearings and hangers |
| HYDRAULICS | 26. Test hydraulic system pressure. |
| | 27. Check and install hoses and tubing. |
| | 28. Replace filters. |

TRADE AND INDUSTRIAL EDUCATION

DIESEL TECHNOLOGY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| HYDRAULICS (continued) | 29. Perform general hydraulic system maintenance. |
| STEERING, SUSPENSION, AND BRAKES | 30. Check and replace steering linkage parts. |
| | 31. Remove and replace brake drums and liners. |
| | 32. Check, remove, repair, or replace brake components. |

TRADE AND INDUSTRIAL EDUCATION

ELECTRICITY

This course organizes subject matter and experiences to include theory, laboratory, and shop work as they pertain to electricity. Each instructional area is related to planning functions; generating and transmitting electricity; and installing and maintaining electrical systems, communications systems, and their components. Instruction emphasizes practical application.

The CIP Code for Electricity is 460302.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| DC FUNDAMENTALS | 9. Explain electrical and electronic components and symbols. |
| | 10. Draw and construct circuits, and calculate circuit values.<br>- Series<br>- Parallel<br>- Series-parallel |
| | 11. Construct an electromagnet. |
| | 12. Construct a simple DC generator. |
| ELECTRONIC COMPONENTS AND CIRCUITS | 13. Test solid-state components.<br>- Diodes<br>- Thyristors<br>- Unijunction transistors<br>- Circuit protection devices |
| RESIDENTIAL WIRING | 14. Construct a residential electrical floor plan. |
| | 15. Install and wire lighting circuits.<br>- Single-pole<br>- Three-way<br>- Three-way and four-way combination |

TRADE AND INDUSTRIAL EDUCATION

ELECTRICITY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| RESIDENTIAL WIRING (continued) | 16. Connect lighting circuits.<br>- Recessed lighting<br>- Fluorescent lighting |
| | 17. Wire a space-heating circuit. |
| | 18. Construct wiring diagrams.<br>- Heat pump circuit<br>- Forced air heating |
| | 19. Install a service entrance main panel and meter base. |
| | 20. Install low voltage circuits.<br>- Signal<br>- Remote lighting |
| | 21. Calculate total job installation requirements. |
| COMMERCIAL WIRING | 22. Obtain electrical wiring installation information.<br>- Commercial floor plan<br>- Specifications |
| | 23. Construct a commercial electrical floor plan. |
| | 24. Install and secure flexible conduit. |
| | 25. Install and secure wire mold. |
| | 26. Install and secure a duct system. |
| | 27. Install conductors in conduit. |

TRADE AND INDUSTRIAL EDUCATION

ELECTRICITY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| COMMERCIAL WIRING (continued) | 28. Install and wire a commercial lighting circuit. |
| | 29. Install receptacle outlets.<br>- Single-phase<br>- Three-phase |
| | 30. Install and wire a commercial low-voltage signal communication circuit. |
| | 31. Install and wire a commercial standby emergency lighting circuit. |
| INDUSTRIAL WIRING | 32. Obtain electrical wiring installation requirements from an industrial electrical plan and/or drawing. |
| | 33. Charge batteries. |
| | 34. Install circuit breakers in panel board. |
| | 35. Install and connect system grounds. |
| | 36. Install lighting fixtures with or without dimmers.<br>- Fluorescent<br>- Incandescent |
| | 37. Install liquid-tight flexible metal conduit. |
| | 38. Install multi-control lighting circuit. |

TRADE AND INDUSTRIAL EDUCATION

ELECTRICITY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| AC AND DC ROTATING EQUIPMENT | 39. Connect motors.<br>- Split-phase induction<br>- Capacitor start<br>- Capacitor run<br>- Three-phase induction |
| ELECTRICAL CONTROLS AND DEVICES | 40. Draw an elementary motor control line diagram.<br>41. Install motor control station.<br>- Automatic<br>- Manual<br>42. Install a three-phase control magnetic starter.<br>43. Install control stations.<br>- Push button<br>- Drum switch<br>44. Install control push button station to change direction of rotation of motor. |

TRADE AND INDUSTRIAL EDUCATION

ELECTRONICS

This program is comprised of three major components--basic electronics, modern technology, and computer servicing. Instruction is provided in the following modules: DC circuitry, AC circuitry, solid-state devices, analog circuits, digital circuits, microprocessors, microcomputers, and optoelectronics.

The CIP Code for Electronics is 470101.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| DC CIRCUITRY | 9. Define volt, ampere, ohm, and watt.<br>10. Identify insulators and conductors.<br>11. Read meter scales.<br>12. Demonstrate the use of measuring devices.<br>- Voltmeter<br>- Ohmmeter<br>- Ammeter<br>- Wattmeter<br>13. Identify the resistor color code.<br>14. Identify basic electrical symbols.<br>15. Work Ohm's Law problems.<br>16. Define direct current (DC).<br>17. Draw DC circuits and use Ohm's Law to solve unknown values.<br>- Series<br>- Parallel<br>- Series-parallel |

TRADE AND INDUSTRIAL EDUCATION

ELECTRONICS

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| DC CIRCUITRY (continued) | 18. Locate and identify circuits.<br>- Open<br>- Short |
| | 19. Wire and measure circuit valves.<br>- Series<br>- Parallel<br>- Series-parallel |
| AC CIRCUITRY | 20. Read meter scales. |
| | 21. Demonstrate the use of measuring devices.<br>- Voltmeter<br>- Ammeter<br>- Wattmeter |
| | 22. Identify basic electrical symbols. |
| | 23. Identify circuits.<br>- Open<br>- Short |
| | 24. Measure watt-hours with a watt-hour meter (or KWH meter). |
| | 25. Define alternating current (AC) and explain its primary advantages over DC. |
| | 26. Explain terms related to frequency (Hertz). |
| | 27. Replace a transformer. |
| | 28. Test a transformer. |

TRADE AND INDUSTRIAL EDUCATION

ELECTRONICS

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| AC CIRCUITRY (continued) | 29. Explain circuitry terms.<br>- Inductance<br>- Inductive reactance<br>- Capacitance<br>- Capacitive reactance |
| | 30. Explain how capacitive reactance and inductive reactance affect the voltage current relationship in an AC circuit. |
| | 31. Explain impedance in an AC circuit. |
| SOLID-STATE DEVICES | 32. Test a typical germanium and silicon semiconductor diode. |
| | 33. Construct and test circuits.<br>- Zener diode<br>- Bipolar transistor amplifier<br>- Junction FET (Field Effect Transistor)<br>- Insulated gate FET amplifier<br>- SCR (Silicon-Controlled Rectifier)<br>- UJT (Unijunction transistor) |
| | 34. Check the operation of a photo transistor. |
| | 35. Test the operation of a typical light-emitting diode. |
| | 36. Construct a test diode circuit semiconductor. |
| | 37. Replace solid-state diodes. |
| | 38. Replace transistors. |

TRADE AND INDUSTRIAL EDUCATION

ELECTRONICS

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| SOLID-STATE DEVICES (continued) | 39. Construct and test a transistor circuit. |
| | 40. Replace IC Chips (Integrated Circuits). |
| | 41. Construct and test an amplifier using an integrated circuit. |
| ANALOG CIRCUITS | 42. Construct and test circuits.<br>- Transistor amplifier<br>- Power supply |
| | 43. Replace power supplies. |
| DIGITAL CIRCUITS | 44. Construct and test circuits.<br>- Diode logic<br>- Transistor logic<br>- TTL logic<br>- CMOS logic gate |
| | 45. Demonstrate the operation and characteristics of flip-flop and counter circuits. |
| | 46. Explain the operation of a shift register. |
| | 47. Demonstrate the operation of a decoder. |
| MICROPROCESSORS | 48. Identify and test clock circuits. |
| | 49. Identify and test data.<br>- Input<br>- Output |

TRADE AND INDUSTRIAL EDUCATION

ELECTRONICS

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| MICROCOMPUTERS | 50. Identify capabilities and characteristics of microcomputers. |
| | 51. Analyze and load basic microcomputer programs. |
| OPTOELECTRONICS | 52. Construct and test LED (Light Emitting Diode) circuit. |

TRADE AND INDUSTRIAL EDUCATION

GRAPHIC ARTS

Graphic Arts provides specialized learning experiences that include theory, laboratory, and shop work as they relate to all phases of typesetting, layout, composition, presswork, binding, flexography, lithography, photo-engraving, and other graphic arts related to the printing industry. Emphasis is on typographical layouts and design, hand and machine typesetting, camera and plate work, imposition, offset press makeup and operation, papercutting, ink and color preparation, binding, and production by silkscreen process. Instruction leads to preparation for various types of employment, such as typesetter, stripper, commercial artist, cameraman, platemaker, cost analyst, expediter, and production planner.

The CIP Code for Graphic Arts is 480201.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| COMPOSITION, LAYOUT, AND PASTEUP | 9. Prepare layout using thumbnail sketches. |
| | 10. Prepare copy for photographing. |
| | 11. Compose cold type.<br>- By hand<br>- With typewriter |
| | 12. Photo-compose with machines. |
| | 13. Prepare line copy. |
| | 14. Prepare combination layout. |
| | 15. Lay out masking sheet. |
| | 16. Use black-and-white photography. |
| | 17. Scale artwork. |
| | 18. Assemble pasteups. |
| | 19. Use various techniques in photography. |

TRADE AND INDUSTRIAL EDUCATION

GRAPHIC ARTS

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| COMPOSITION, LAYOUT, AND PASTEUP (continued) | 20. Proofread typed composition. |
| | 21. Proof single color. |
| | 22. Strip negatives. |
| CAMERA WORK | 23. Operate cameras. |
| | 24. Use lighting in camera work. |
| | 25. Shoot line copy. |
| | 26. Select photo materials. |
| | 27. Make single-color halftone negatives. |
| | 28. Make negatives from printed halftone. |
| | 29. Strip negatives for line multicolor. |
| | 30. Line color photography. |
| DARKROOM | 31. Lay out the darkroom. |
| | 32. Prepare developing solutions. |
| | 33. Develop the film. |
| | 34. Perform darkroom printing operations. |
| PLATEMAKING | 35. Expose and develop subtractive plates. |
| | 36. Prepare electrostatic plates. |
| OFFSET PRESS WORK | 37. Test offset papers (grain). |
| | 38. Prepare dampening system and solutions. |

TRADE AND INDUSTRIAL EDUCATION

GRAPHIC ARTS

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| OFFSET PRESS WORK (continued) | 39. Prepare the inking system for operation. |
| | 40. Install an offset plate. |
| | 41. Handle plates on the press. |
| | 42. Install a new blanket. |
| | 43. Set the impression cylinder. |
| | 44. Prepare, operate, and troubleshoot offset press. |
| BINDING | 45. Cut paper. |
| | 46. Bind pamphlets using plastic binders. |
| | 47. Perform padding operations. |
| | 48. Collate with machines. |
| | 49. Fold different jobs. |
| | 50. Perform wrapping operations. |

TRADE AND INDUSTRIAL EDUCATION

HEATING, AIR CONDITIONING, AND REFRIGERATION

This course provides classroom and shop experiences that enable students to become proficient in the installation, repair, and maintenance of commercial, industrial, and domestic air-conditioning systems. Instruction includes the theory and application of basic principles involved in conditioning of air: cooling, heating, filtering, controlling humidity; the operating characteristics of various units and parts; blueprint reading; the use of technical reference manuals; the diagnosis of malfunctions; the overhaul, repair, and adjustment of units and parts, such as pumps, compressors, valves, springs, and connections; and the repair of electric and pneumatic control systems.

The CIP Code for Heating, Air Conditioning, and Refrigeration is 470201.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| TUBING, FITTINGS, SOLDERING, AND BRAZING | 9. Construct a flare connection. |
| | 10. Construct a swage joint. |
| | 11. Bend tubing to specific angles. |
| | 12. Set up an oxyacetylene welding station. |
| | 13. Light and adjust the torch. |
| | 14. Soft solder copper fitting to copper tubing. |
| | 15. Silver braze tubing.<br>- Steel<br>- Copper<br>- Steel to copper |
| BASIC COMPRESSION REFRIGERATION | 16. Draw a basic refrigeration system. |
| | 17. Install filter dryers. |
| | 18. Install a capillary tube into a filter drive. |

TRADE AND INDUSTRIAL EDUCATION

HEATING, AIR CONDITIONING, AND REFRIGERATION

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| BASIC COMPRESSION REFRIGERATION (continued) | 19. Front-seat, mid-position, and back-seat service valve. |
| | 20. Compute temperature-pressure problems. |
| | 21. Determine pressures and temperatures.<br>- Domestic systems<br>- Air conditioners<br>- Commercial systems |
| | 22. Evacuate systems.<br>- Domestic refrigeration<br>- Air conditioners<br>- Commercial systems |
| | 23. Triple evacuate a refrigeration system. |
| | 24. Locate and repair a refrigerant leak on a domestic refrigerator. |
| | 25. Pressurize a system with dry nitrogen and refrigerant to locate and repair leaks. |
| DOMESTIC REFRIGERATION | 26. Charge a domestic refrigerator on the low side of the system. |
| | 27. Remove and replace a compressor. |
| | 28. Install capillary tubing. |
| | 29. Diagnose and repair electrical circuits. |
| | 30. Test, remove, and replace defrost system components. |

TRADE AND INDUSTRIAL EDUCATION

HEATING, AIR CONDITIONING, AND REFRIGERATION

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| INTRODUCTION TO ELECTRICITY | 31. Produce voltage by various means.<br>- Chemical<br>- Thermal<br>- Magnetism |
| | 32. Construct an electromagnet. |
| | 33. Perform measurements in a simple circuit.<br>- Voltage<br>- Amperage<br>- Resistance |
| | 34. Test fuses. |
| | 35. Test capacitors. |
| | 36. Construct series and parallel circuits and calculate values. |
| | 37. Measure the resistance of a single-phase compressor. |
| | 38. Determine the operating condition of a compressor. |
| ELECTRICAL COMPONENTS | 39. Measure amperage of gas valve or heat relay. |
| | 40. Adjust heat anticipator. |
| | 41. Install a single-stage heat and a single-stage cool thermostat. |
| | 42. Wire relays.<br>- Starter<br>- Fan |
| | 43. Adjust a high pressure control. |

TRADE AND INDUSTRIAL EDUCATION

HEATING, AIR CONDITIONING, AND REFRIGERATION

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| ELECTRIC MOTORS | 44. Connect a shaded-pole motor. |
| | 45. Disassemble and assemble a single-phase motor. |
| | 46. Measure the resistance of windings in a split-phase motor and identify the start-run windings. |
| | 47. Determine common, start, and run terminals of a single-phase compressor. |
| | 48. Connect motors.<br>- Capacitor start<br>- PSC<br>- CSR |
| | 49. Adjust v-belt tension. |
| WIRING DIAGRAMS | 50. Draw a basic schematic wiring diagram. |
| WINDOW AIR CONDITIONERS | 51. Clean a window air-conditioner unit. |
| | 52. Remove and replace a fan motor. |
| | 53. Locate and repair a refrigerant leak on a window air conditioner. |
| AIR CONDITIONING | 54. Test operating pressure.<br>- Residential<br>- Commercial and/or industrial |
| | 55. Test the charge in a residential system. |
| COMMERCIAL REFRIGERATION | 56. Adjust the superheat. |
| | 57. Determine the condition of an electric defrost system. |

TRADE AND INDUSTRIAL EDUCATION

HEATING, AIR CONDITIONING, AND REFRIGERATION

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| COMMERCIAL REFRIGERATION (continued) | 58. Evacuate and change a commercial refrigeration system. |
| | 59. Adjust the high and low pressure controls of a commercial system. |
| GAS HEATING | 60. Determine temperature rise across gas furnace. |
| | 61. Determine gas pressure of a furnace. |
| | 62. Remove and replace system components.<br>- Fan-limit control<br>- Gas valve<br>- Transformer<br>- Wall thermostat<br>- Blower motor |
| ELECTRIC HEATING | 63. Determine air flow and temperature rise across electric furnace. |
| | 64. Determine voltage to heating element. |
| | 65. Determine the condition of the blower and motor. |
| | 66. Replace heat pump electrical components.<br>- Defrost timers<br>- Sensor thermostats<br>- Reversing valves<br>- Wall thermostats<br>- Blower motors<br>- Strip heaters |

TRADE AND INDUSTRIAL EDUCATION

HEATING, AIR CONDITIONING, AND REFRIGERATION

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| ELECTRIC HEATING (continued) | 67. Replace heat pump sealed-system components.<br>- Compressors<br>- Reversing valves<br>- Condensers<br>- Evaporators<br>- Check valves<br>- Metering devices |
| | 68. Evacuate and charge a heat pump. |

TRADE AND INDUSTRIAL EDUCATION

MAINTENANCE TECHNOLOGY

This course provides training in the maintenance of such facilities as hospitals, schools, hotels, motels, office complexes, condominiums, apartment complexes, and shopping centers. Topics of instruction are electrical repair; heating, cooling, and appliance repair; plumbing repair; painting, wall and floor covering; carpentry repair; masonry repair; and general maintenance.

The CIP Code for Maintenance Technology is 460499.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| ELECTRICAL REPAIR | 9. Demonstrate a knowledge of basic electricity. |
| | 10. Identify and use test equipment. |
| | 11. Identify electrical tools and explain use, care, and storage. |
| | 12. Construct circuits.<br>- Series<br>- Parallel |
| | 13. Locate circuit overload. |
| | 14. Test, reset, or replace circuits. |
| | 15. Obtain electrical wiring installation specifications. |
| | 16. Repair defective lighting circuits.<br>- Single-pole<br>- Three-way<br>- Three-way and four-way combination |

TRADE AND INDUSTRIAL EDUCATION

MAINTENANCE TECHNOLOGY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| ELECTRICAL REPAIR (continued) | 17. Install outlet boxes for receptacles and switches in existing walls. |
| | 18. Replace defective light socket. |
| | 19. Connect a recessed lighting circuit. |
| | 20. Install, wire, and replace a defective duplex receptacle and split-circuit receptacle outlet circuit. |
| | 21. Install and wire a special-purpose receptacle outlet circuit. |
| | 22. Install and connect a fan controlled by switch. |
| | 23. Repair or replace a defective fluorescent lighting circuit. |
| | 24. Repair or replace a space heating circuit. |
| | 25. Add telephone outlets. |
| | 26. Replace electrical cables in old conduit. |
| HEATING, COOLING, AND APPLIANCE REPAIR | 27. Solder with irons and guns. |
| | 28. Make electrical wire connections using solderless devices. |
| | 29. Attach a separable plug to an appliance. |
| | 30. Clean condenser, valve, and trap on refrigeration unit. |

TRADE AND INDUSTRIAL EDUCATION

MAINTENANCE TECHNOLOGY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| HEATING, COOLING, AND APPLIANCE REPAIR (continued) | 31. Clean evaporator drain tube and intake filter on window air conditioner. |
| | 32. Light pilot light on gas-fed cook stove. |
| | 33. Replace gas water heater parts.<br>- Control valve<br>- Thermo-coupling |
| | 34. Replace an electric range heating element. |
| PLUMBING REPAIR | 35. Thread iron pipe by hand. |
| | 36. Install a repair clamp on water pipe. |
| | 37. Cut and flare metal tubing. |
| | 38. Install screw-on fitting on water pipe. |
| | 39. Join copper tubing by compression method. |
| | 40. Cut and join plastic pipe. |
| | 41. Cut holes for vertical run of pipe.<br>- Marking ceiling and floor |
| | 42. Paint exposed pipes. |
| | 43. Replace or repair water closet.<br>- Tank-type<br>- Flush valve-type |
| | 44. Replace or repair a wall-hung lavatory. |

TRADE AND INDUSTRIAL EDUCATION

MAINTENANCE TECHNOLOGY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| PLUMBING REPAIR (continued) | 45. Replace and/or repair electric water heater. |
| | 46. Clear drains and sewers. |
| | 47. Install a dishwasher. |
| | 48. Cut sheet metal. |
| | 49. Test a water supply system. |
| PAINTING, WALL, AND FLOOR COVERINGS | 50. Hang wallpaper. |
| | 51. Install resilient floor covering. |
| | 52. Replace ceramic wall tile. |
| | 53. Paint a wall section. |
| | 54. Varnish a wood surface. |
| CARPENTRY REPAIR | 55. Use carpentry hand tools. |
| | 56. Use portable and stationary power tools. |
| | 57. Identify and use common fasteners. |
| | 58. Cut stock to size. |
| | 59. Cut dimensional lumber to size. |
| | 60. Build saw horses. |
| | 61. Select lumber and building materials for specific repair assignments. |
| | 62. Identify framing components. |
| | 63. Read blueprints. |

TRADE AND INDUSTRIAL EDUCATION

MAINTENANCE TECHNOLOGY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| CARPENTRY REPAIR (continued) | 64. Complete a materials list and estimate the cost of construction. |
| | 65. Replace or install shelving. |
| | 66. Perform basic carpentry repairs.<br>- Cabinets<br>- Doors<br>- Plastered walls<br>- Painted finishes<br>- Broken glass |
| | 67. Cut sink opening in countertop. |
| | 68. Sand surfaces for finishing. |
| | 69. Construct a square frame. |
| | 70. Bore holes. |
| | 71. Apply stain. |
| MASONRY REPAIR | 72. Pour and finish a concrete slab. |
| | 73. Repair damaged concrete. |
| | 74. Clean masonry walls. |
| | 75. Repair masonry floor in commercial sites. |
| | 76. Repair ceramic tile in commercial facilities. |
| GENERAL MAINTENANCE AND GROUNDSKEEPING | 77. Clean metal surfaces. |
| | 78. Apply chemical treatment to diseased plants. |

TRADE AND INDUSTRIAL EDUCATION

MAINTENANCE TECHNOLOGY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| GENERAL MAINTENANCE AND GROUNDSKEEPING (continued) | 79. Apply chemical treatment to plants infested with insects. |
| | 80. Sharpen knives. |
| | 81. Replace handles on tools. |
| | 82. Prune and trim plants.<br>- Trees<br>- Shrubs |
| | 83. Transplant trees. |
| | 84. Adjust engine idle speed on small engines. |
| | 85. Service carburetor air cleaners on small engines. |
| | 86. Sharpen lawn mower blade. |

TRADE AND INDUSTRIAL EDUCATION

MAJOR APPLIANCE REPAIR

Major Appliance Repair provides classroom and shop experiences concerned with the theory of electrical circuitry, simple gearing, linkages, and lubrication in the operation, maintenance, and repair of components including relays, time switches, pumps, and agitators used in appliances, such as washers, dryers, microwave ovens, water heaters, and stoves. Related training is provided in the use of tools, test equipment, and service manuals, as well as in the making of estimates for repairs.

The CIP Code for Major Appliance Repair is 470106.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| INSTALLING APPLIANCES | 9. Install major appliances.<br>- Window air conditioner<br>- Free-standing appliances<br>- Dishwasher<br>- Electric oven<br>- Electric range<br>- Garbage disposal<br>- Ice maker |
| MAINTAINING AND REPAIRING CONTROLS | 10. Replace clock-timer.<br>11. Replace ignition controls.<br>12. Replace switches.<br>- Limit<br>- Float<br>- Leaf<br>- Door<br>- Pressure<br>- Safety<br>- Interlock<br>- Timer<br>- Warp<br>- Thermostat |

TRADE AND INDUSTRIAL EDUCATION

MAJOR APPLIANCE REPAIR

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| MAINTAINING AND REPAIRING ELECTRICAL SYSTEMS | 13. Replace electrical components.<br>- Capacitors<br>- Fuses<br>- Contractors<br>- Relays<br>- Defrost heaters<br>- Heating elements<br>- Fan motors<br>- Fuse resistors<br>- Transformers<br>- Solenoids |
| | 14. Solder and/or unsolder connectors. |
| | 15. Splice wires. |
| MAINTAINING PLUMBING SYSTEMS | 16. Adjust gas burners. |
| | 17. Clean filters and gas burners. |
| | 18. Replace hoses. |
| | 19. Replace main gas valve. |
| | 20. Replace water inlet valve. |
| PERFORMING MECHANICAL REPAIRS | 21. Adjust door latch. |
| | 22. Adjust pulley belts. |
| | 23. Change oil. |
| | 24. Clean coils and filters. |
| | 25. Install gas orifice. |
| | 26. Install range hood. |
| | 27. Lubricate bearing seal. |

TRADE AND INDUSTRIAL EDUCATION

MAJOR APPLIANCE REPAIR

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| PERFORMING MECHANICAL REPAIRS (continued) | 28. Replace mechanical components.<br>- Agitator<br>- Baskets<br>- Blowers<br>- Door gaskets<br>- Motors<br>- Filters<br>- Impellers<br>- Pulleys<br>- Belts<br>- Seals |
| TROUBLESHOOTING AND/OR DIAGNOSIS | 29. Troubleshoot systems. |
| REFRIGERATION AND AIR CONDITIONING | 30. Replace refrigeration components.<br>- Condensers<br>- Evaporators<br>- Compressors<br>- Metering devices |
| | 31. Leak test, evacuate, and charge domestic refrigeration systems. |

TRADE AND INDUSTRIAL EDUCATION

MASONRY

Masonry provides specialized classroom and shop experiences concerned with the cutting, chipping, and fixing in position of blocks and bricks, using bonding materials and hand tools. Instruction in reading architectural plans, planning, safety, and estimating is included.

The CIP Code for Masonry is 460102.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| SITE PREPARATIONS, FOUNDATIONS, AND FOOTINGS | 9. Locate and square corners. |
| | 10. Dig footings and place grade stakes. |
| | 11. Pour a concrete footing. |
| | 12. Set up scaffolding. |
| BRICKLAYING, JOINTING, AND POINTING | 13. Hand cut and saw brick. |
| | 14. Hand mix and machine mix mortar. |
| | 15. Set up mortar board with mortar. |
| | 16. Bond a brick wall. |
| | 17. Spread mortar. |
| | 18. Lay a stretcher course and a full header course to the line. |
| | 19. Lay a brick corner. |
| | 20. Lay a common bond wall. |
| | 21. Tool brick joints. |
| | 22. Raise a brick foundation wall. |
| | 23. Clean brick walls. |

TRADE AND INDUSTRIAL EDUCATION

MASONRY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| BLOCKLAYING, POINTING, AND JOINTING | 24. Hand cut and saw blocks. |
| | 25. Set up mortar board with mortar. |
| | 26. Bond a block wall. |
| | 27. Spread mortar. |
| | 28. Lay a stretcher course to a line. |
| | 29. Lay walls.<br>- Running bond<br>- Stack bond |
| | 30. Tool block joints. |
| | 31. Lay a block corner. |
| | 32. Clean a block wall. |
| BRICK CONSTRUCTION | 33. Mark window sill, window, and door heights. |
| | 34. Mark courses to height. |
| | 35. Set up corner poles (speed leads). |
| | 36. Construct a brick veneer wall. |
| | 37. Lay a rowlock window sill. |
| | 38. Construct columns and piers. |
| BLOCK CONSTRUCTION | 39. Construct a story pole for a concrete block wall. |
| | 40. Lay out and bond doors and windows. |
| | 41. Install wall anchors and ties. |

TRADE AND INDUSTRIAL EDUCATION

PLUMBING

Plumbing provides specialized classroom and shop experience concerned with layout, assembly, installing, altering, and repairing piping systems. Training includes interpreting architectural plans and estimating material and costs. The Southern Standard Plumbing Code is emphasized.

The CIP Code for Plumbing is 460502.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| STEEL PIPE | 9. Cut and ream steel pipe. |
| | 10. Thread steel pipe.<br>- Three-way dies<br>- Ratchet dies |
| | 11. Prepare a steel pipe joint with various tools.<br>- Vise and one-pipe wrench<br>- Two-pipe wrench<br>- Chain wrench<br>- Power vise |
| | 12. Assemble a union of steel pipe using two-pipe wrenches. |
| | 13. Assemble a brass valve on steel pipe. |
| CAST-IRON SOIL PIPE | 14. Cut cast-iron pipe using scissor-type chain cutters. |
| | 15. Prepare furnace and lead pot for melting lead. |
| | 16. Prepare a horizontal hub and spigot cast-iron joint. |
| | 17. Prepare a no-hub cast-iron joint. |

TRADE AND INDUSTRIAL EDUCATION

PLUMBING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| COPPER | 18. Bend copper tubing. |
| | 19. Flare copper tube using yoke and screw-type flaring tool. |
| | 20. Cut copper tubing. |
| | 21. Clean copper pipe, copper tube, and fittings. |
| | 22. Assemble torch kit. |
| | 23. Construct copper joints.<br>- Flared<br>- Compression<br>- Brazed<br>- Silver solder |
| PLASTIC AND CLAY PIPE | 24. Cut plastic pipe. |
| | 25. Prepare a solvent-weld plastic pipe joint. |
| | 26. Prepare a polyethylene plastic tube joint. |
| SUPPORTING AND HANGING PIPE | 27. Hang pipe using pipe straps.<br>- Band iron<br>- Clevis hanger |
| | 28. Install a beam clamp. |
| | 29. Support pipe using a riser clamp. |
| | 30. Install backing boards for fixtures. |
| | 31. Install pipe supports with toggle bolt anchor.<br>- Bathtub<br>- Curtain rod<br>- Shower head |

TRADE AND INDUSTRIAL EDUCATION

PLUMBING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| MENSURATION | 32. Read measurements.<br>- End-to-center<br>- Center-to-center<br>- Center-to-center overall<br>- Back-to-back<br>- Throat-to-throat |
| | 33. Grade a length of pipe with a level. |
| | 34. Strike a straight line on a level surface using a chalk line. |
| | 35. Measure for fitting allowance. |
| | 36. Prepare a tripod and transit level for use. |
| WASTE, VENT, AND DRAINAGE SYSTEMS | 37. Rough-in waste, vent, and drainage systems.<br>- Soil stack<br>- Trap arm<br>- Water stack<br>- Vent stack |
| | 38. Install a roof flashing. |
| | 39. Install house or building sewer.<br>- Excavation trench<br>- Drain and clean-out<br>- Street sewer connections |
| | 40. Test a drainage system. |
| | 41. Install drains.<br>- Floor<br>- Roof |

TRADE AND INDUSTRIAL EDUCATION

PLUMBING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| WASTE, VENT, AND DRAINAGE SYSTEMS (continued) | 42. Rough-in equipment.<br>- Kitchen sink<br>- Washing machine<br>- Service sink<br>- Drinking fountain |
| | 43. Construct an isometric drawing of the drainage system of a two-bathroom house. |
| WATER SUPPLY | 44. Install a hose bib. |
| | 45. Rough-in water supplies.<br>- Sink<br>- Tank-type water closet<br>- Urinal<br>- Flush-valve water closet<br>- Bathtub and/or shower<br>- Washing machine<br>- Drinking fountain<br>- Service sink<br>- Water heater |
| | 46. Test a water supply system. |
| | 47. Install and trim a wall-hung lavatory. |
| | 48. Trim out a kitchen sink. |
| | 49. Install fixtures.<br>- Kitchen sink<br>- Garbage disposal<br>- Grease trap<br>- Urinal<br>- Water heater<br>- Water closet<br>- Tub and shower valve<br>- Shower stall<br>- Drinking fountain<br>- Service sink<br>- Ice maker |

TRADE AND INDUSTRIAL EDUCATION

PLUMBING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| PLUMBING REPAIR | 50. Replace water closet components.<br>- Wax ring<br>- Ball cock<br>- Flush valve<br>- Tank gasket |
| | 51. Replace lavatory components.<br>- Faucet washers and seats<br>- Traps<br>- Faucets |
| | 52. Replace bathtub components.<br>- Shoe and overflow<br>- Diverter<br>- Diverter washer and seat<br>- Shower arm and head |
| | 53. Replace kitchen sink and/or components.<br>- Faucets<br>- Strainers<br>- Traps |
| | 54. Replace water heater and/or components.<br>- Control valves<br>- Thermocouples<br>- Elements<br>- Thermostats |
| | 55. Clear drains and sewers. |

TRADE AND INDUSTRIAL EDUCATION

PRECISION MACHINING

Precision Machining provides specialized classroom and shop experiences in all aspects of shaping metal parts. Instruction involves making computations relating to work dimensions, tooling, feeds, and speeds of machining. Also emphasized are bench work, as well as lathes, shapers, milling machines, grinders, and drills; the uses of precision measuring instruments, such as layout tools, micrometers, and gauges; methods of machining and heat treatment of various metals; blueprint reading; and the layout of machine parts. Instruction prepares students to operate and repair all machines.

The CIP Code for Precision Machining is 480503.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| BENCH WORK | 9. Lay out, cut, and file a square workpiece. |
| | 10. Precision measure a workpiece. |
| | 11. Cut threads.<br>- External<br>- Internal |
| | 12. Broach an internal keyway. |
| | 13. Scribe circles, radii, and parallel lines on workpiece. |
| | 14. Remove broken bolts and taps. |
| | 15. Set up and install a bushing in a workpiece. |
| | 16. Perform grinding wheel operations.<br>- Inspect<br>- Mount<br>- True<br>- Dress |

TRADE AND INDUSTRIAL EDUCATION

PRECISION MACHINING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| BENCH WORK (continued) | 17. Adjust wheel guard and tool rest. |
| | 18. Hand-grind radius on tool bit.<br>- Concave<br>- Convex |
| | 19. Hand-grind tools.<br>- Center punch<br>- Chisel |
| LAYOUT | 20. Lay out hole spacing and outside dimensions. |
| | 21. Lay out angles on workpiece. |
| | 22. Lay out bolt circle on workpiece. |
| DRILL PRESS | 23. Clean, inspect, and lubricate drill press. |
| | 24. Sharpen drills.<br>- By hand<br>- With machines |
| | 25. Centerdrill, drill, and ream hole in workpiece. |
| | 26. Bore and counterbore holes in workpiece. |
| | 27. Spotface workpiece. |
| | 28. Countersink hole in workpiece. |
| | 29. Hand-tap hole in workpiece. |
| | 30. Power-tap hole in workpiece. |
| POWER SAW | 31. Clean, inspect, and lubricate vertical and/or horizontal band saws. |

TRADE AND INDUSTRIAL EDUCATION

PRECISION MACHINING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| POWER SAW (continued) | 32. Select, cut, weld, and install band saw blade. |
| | 33. Lay out and saw a workpiece.<br>- Angle cut<br>- Straight cut |
| HEAT TREATMENT | 34. Test hardness of workpiece. |
| LATHE | 35. Clean, inspect, and lubricate lathe. |
| | 36. Mount independent, universal, and collet chucks. |
| | 37. True work in independent chuck. |
| | 38. Shape and sharpen left-hand and right-hand cutting tools. |
| | 39. Center tool bit with center in tailstock. |
| | 40. Face workpiece. |
| | 41. Center-drill workpiece. |
| | 42. Straight-turn workpiece to shoulder and neck. |
| | 43. Align tailstock. |
| | 44. Perform lathe operations on workpiece.<br>- Knurl<br>- Drill hole<br>- Ream hole<br>- Countersink<br>- Tap hole<br>- Bore hole<br>- Counterbore hole |

TRADE AND INDUSTRIAL EDUCATION

PRECISION MACHINING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| LATHE (continued) | 45. Form-cut workpiece with forming tool. |
| | 46. Machine O-ring grooves.<br>- External<br>- Internal |
| | 47. Perform parting of workpiece. |
| | 48. Machine external angle with compound. |
| | 49. Machine external taper using taper attachment. |
| | 50. Machine internal tapered surface. |
| | 51. Cut taper using tailstock offset method. |
| | 52. Turn long shaft between centers. |
| | 53. Indicate shaft in lathe using cat-head. |
| | 54. Machine soft jaws. |
| | 55. Chase internal and external right-hand and left-hand unified threads. |
| | 56. Pick up the lead on external unified threads. |
| MILLING MACHINE | 57. Clean, inspect, and lubricate milling machine. |
| | 58. Align vise on milling machine table. |

TRADE AND INDUSTRIAL EDUCATION

PRECISION MACHINING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| MILLING MACHINE (continued) | 59. Set up workpiece using clamps. |
| | 60. Flycut workpiece surface. |
| | 61. Locate center of workpiece. |
| | 62. Align milling machine head. |
| | 63. Mill a square metal block. |
| | 64. Drill equally spaced holes in workpiece. |
| | 65. Centerdrill, drill, and ream hole in workpiece. |
| | 66. Machine an outside radius using rotary table. |
| | 67. Cut T-slot in workpiece. |
| | 68. Machine woodruff keyway in workpiece. |
| | 69. End mill keyseats in workpiece. |
| | 70. Center rotary table with spindle. |
| | 71. Bore and counterbore hole in workpiece. |
| | 72. Machine slots in workpiece. |
| | 73. Tap holes in workpiece. |
| SURFACE GRINDER | 74. Clean, inspect, and lubricate grinder. |
| | 75. Perform grinding wheel operations.<br>- Inspect<br>- Mount<br>- True<br>- Dress |

TRADE AND INDUSTRIAL EDUCATION

PRECISION MACHINING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| SURFACE GRINDER (continued) | 76. Grind flat surface. |
| | 77. Grind workpiece square and parallel. |

TRADE AND INDUSTRIAL EDUCATION

SHEET METAL

This course provides specialized classroom and shop experiences in the layout, fabrication, erection, installation, and maintenance of items made of steel, copper, stainless steel, and aluminum, such as ventilation, air-conditioning, and heating ducts; kitchen equipment; signs; furniture; and skylights. Instruction emphasizes the use of hand tools and machines, such as the cornice brake, forming rolls, and squaring shear. Drafting and blueprint reading are included.

The CIP Code for Sheet Metal is 480506.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| HAND TOOLS | 9. Identify and use threaded fasteners. |
| | 10. Identify and use hammers in sheet metal work. |
| | 11. Cut sheet metal with hand snips. |
| | 12. Drill holes in sheet metal. |
| | 13. Make various seams.<br>- Single<br>- Grooved<br>- Dovetailed |
| | 14. Set rivets using riveting hammer. |
| MACHINE PROCESSES | 15. Form sheet metal with hand brake. |
| | 16. Use slip roll forming machine. |
| | 17. Make beads with beading machine. |
| | 18. Turn edge with burring machine. |
| | 19. Cut sheet metal with squaring shears. |

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| **MACHINE PROCESSES (continued)** | 20. Crimp sheet metal pipe.<br>21. Lay out and make patterns.<br>22. Lay out and fabricate geometric designs.<br>- Square<br>- 90 degree square elbow with square heel and throat<br>- 90 degree curved elbow with square throat<br>- 90 degree curved elbow with curved throat<br>- 90 degree change elbow with curved throat and heel<br>- 90 degree two-way "Y" branch with curved throat and combination straight and curved heel<br>- Transition with three sides straight<br>- Transition center tapered with two sides straight<br>- Transition with offset and two sides straight<br>- 90 degree rectangular-to-rectangular change elbow<br>- Transition change joint with two sides straight<br>- Four-piece 90 degree elbow<br>- Square-to-round<br>- Round taper |

TRADE AND INDUSTRIAL EDUCATION

SMALL ENGINE REPAIR

This course provides classroom and shop experiences in most phases of repair work on small engines. It provides students with training in the use of diagnostic and testing equipment, technical manuals, and a variety of hand and power tools. Instruction and practice are given in the diagnosis of malfunctions; disassembly of units, parts inspection, and repair; engine overhaul and/or repair; ignition systems, carburetion, electrical systems, drive mechanisms, and various components.

The CIP Code for Small Engine Repair is 470606.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| SMALL ENGINES DESIGN AND COMPONENTS | 9. Identify four-cycle and two-cycle engine components. |
| | 10. Describe the operation of engine systems. |
| | 11. Determine engine identification from engine decal. |
| FUEL SYSTEM | 12. Service or replace a fuel filter. |
| | 13. Clean fuel tank and lines. |
| | 14. Service and adjust carburetors.<br>- Vacuum-type<br>- Float-type<br>- Diaphragm-type |
| IGNITION SYSTEM | 15. Gauge and replace a spark plug. |
| | 16. Service a flywheel. |
| | 17. Remove and replace points and condenser. |
| | 18. Test and replace an ignition condenser, coil, and wire. |
| | 19. Set dwell and timing. |

TRADE AND INDUSTRIAL EDUCATION

SMALL ENGINE REPAIR

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| IGNITION SYSTEM (continued) | 20. Adjust armature air gap. |
| | 21. Remove and replace a safety switch. |
| EXHAUST SYSTEM | 22. Remove and replace a muffler. |
| SMALL ENGINE OVERHAUL | 23. Disassemble and inspect engine components. |
| | 24. Ridge ream a cylinder. |
| | 25. Grind valves and valve seats. |
| | 26. Deglaze and clean a cylinder. |
| | 27. Replace damaged threads in a small engine.<br>- Helicoils or inserts<br>- Tap and die sets |
| | 28. Remove and replace engine components.<br>- Piston rings<br>- Piston and connecting rod assembly<br>- Camshaft<br>- Oil seals<br>- Oil dipper, slinger, or pump<br>- Case cover o· sump<br>- Valves<br>- Valve lifters<br>- Cylinder head |
| | 29. Install a short block. |
| MANUAL STARTERS | 30. Remove and replace manual and starter components.<br>- Starter spring and clutch<br>- Friction brake<br>- Pawls, cup, and rope |

TRADE AND INDUSTRIAL EDUCATION

SMALL ENGINE REPAIR

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| ELECTRICAL SYSTEM | 31. Service a battery. |
| | 32. Troubleshoot a starting circuit. |
| | 33. Replace a starter motor. |
| CLUTCHES AND DRIVE MECHANISMS | 34. Repair and adjust a belt drive and chain drive assembly. |
| ORDERING AND BOOKKEEPING | 35. Determine parts numbers from a catalog and microfiche. |
| LAWN AND GARDEN EQUIPMENT REPAIR | 36. Grind and balance a rotary mower blade. |
| | 37. Remove and replace a blade adapter. |
| | 38. Lubricate a riding mower. |
| | 39. Remove and replace drive cogs on a self-propelled mower. |
| | 40. Clean, inspect, and service a riding mower cutting deck. |
| | 41. Remove and replace mower components.<br>- Throttle cable<br>- Steering rods<br>- Bushings<br>- Wheel bearings<br>- Spindles<br>- Wheels |
| | 42. Inspect and clean an air cooling system. |
| CHAIN SAW REPAIR | 43. Sharpen a chain. |
| | 44. Lubricate a roller nose bar. |
| | 45. Replace and adjust a chain. |

TRADE AND INDUSTRIAL EDUCATION

SMALL ENGINE REPAIR

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| CHAIN SAW REPAIR (continued) | 46. Install a guide bar. |
| | 47. Overhaul a manual oiler. |
| SHOP MANAGEMENT | 48. Prepare and submit a warranty claim. |

## TRADE AND INDUSTRIAL EDUCATION

## TECHNICAL DRAFTING

Technical Drafting provides specialized learning experiences in both the theoretical and practical aspects of the subject. The class work and the laboratory and/or shop work relate to the gathering and translating of data or specifications, which include the aspects of planning, preparing, and interpreting mechanical, architectural, structural, pneumatic, marine, electrical/electronic, topographical, and other drawings and sketches. Instruction is designed to provide experiences in drawing; the use of reproduction, materials, equipment, and processes; the preparation of reports and data sheets for writing specification; the development of plan and process charts and drawings; and the development of models, including CAD/CAM systems and techniques.

The CIP Code for Technical Drafting is 480105.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| TOOLS AND PROCEDURES | 9. Set up a drafting machine. |
| | 10. Draw pencil lines. |
| | 11. Read and transfer measurements. |
| | 12. Produce a diazo print. |
| FREEHAND LETTERING AND GEOMETRIC CONSTRUCTIONS | 13. Letter freehand.<br>- Letters<br>- Numbers |
| | 14. Draw geometric constructions, lines, polygons, and ellipses. |
| MULTIVIEW FREEHAND AND INSTRUMENT DRAWINGS | 15. Prepare a multiview freehand sketch. |
| | 16. Interpret and draw an orthographic projection drawing. |
| | 17. Letter with mechanical lettering devices and templates. |

TRADE AND INDUSTRIAL EDUCATION

TECHNICAL DRAFTING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| MULTIVIEW FREEHAND AND INSTRUMENT DRAWINGS (continued) | 18. Construct a drawing with a technical ink pen. |
| DIMENSIONS, NOTATIONS, AND SYMBOLS | 19. Apply dimensions, notes, and symbols to an orthographic drawing. |
| SECTIONS AND CONVENTIONS/AUXILIARY VIEWS | 20. Draw sectional views applying conventional practices. |
| | 21. Construct primary and secondary auxiliary views. |
| PICTORIAL DRAWING | 22. Construct isometric, oblique, and perspective drawings. |
| INTERSECTIONS AND DEVELOPMENTS | 23. Draw lines of intersection. |
| | 24. Draw the intersection of planes and solids. |
| | 25. Draw a parallel line development. |
| | 26. Develop and lay out a transition. |
| MECHANICAL DRAFTING | 27. Dimension and apply notations and/or symbols to a mechanical drawing. |
| | 28. Apply precision dimensioning and standard fits. |
| ARCHITECTURAL DRAFTING AND RESIDENTIAL DESIGN DRAFTING | 29. Dimension and apply notations and/or symbols to an architectural drawing. |
| | 30. Lay out and sketch a residential floor plan. |
| | 31. Complete specification forms. |
| | 32. Draw a residential floor and foundation plan. |

TRADE AND INDUSTRIAL EDUCATION

TECHNICAL DRAFTING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| **ARCHITECTURAL DRAFTING AND RESIDENTIAL DESIGN DRAFTING (continued)** | 33.. Draw residential elevations. |
| | 34. Prepare residential door, window, and finish schedules. |
| | 35. Prepare residential plumbing and electrical plans. |
| **LIGHT COMMERCIAL DESIGN DRAFTING** | 36. Lay out and sketch a commercial floor plan. |
| | 37. Draw a commercial floor, site, and foundation plan. |
| | 38. Draw commercial section drawings. |
| | 39. Prepare commercial door, window, and finish schedules. |
| | 40. Prepare a commercial plumbing plan. |
| **STRUCTURAL DRAFTING** | 41. Dimension and apply notations and/or symbols to a structural drawing. |
| | 42. Draw structural steel shapes. |
| | 43. Draw column and truss details. |
| **PIPING DRAFTING** | 44. Dimension and apply notations and/or symbols to a piping drawing. |
| **CIVIL DRAFTING** | 45. Dimension and apply notations and/or symbols to an electrical and electronic drawing. |
| | 46. Sketch symbols and line conventions.<br>- Electrical<br>- Electronic |

TRADE AND INDUSTRIAL EDUCATION

TECHNICAL DRAFTING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| COMPUTER-AIDED DESIGN | 47. Interpret details on Computer-Aided Design (CAD) drawings. |
| | 48. Enter drafting commands on a CAD terminal. |
| | 49. Produce an engineering drawing on a CAD terminal. |
| | 50. Produce multiple views on a CAD terminal. |

## TRADE AND INDUSTRIAL EDUCATION

## UPHOLSTERY

Upholstery provides classroom and shop experiences in all aspects of upholstering, including furniture, automobile interiors, caskets, mattresses, and bedsprings. Instruction includes history and styles of furniture; installing, repairing, arranging, and securing springs, filler, padding, and covering material; patternmaking; cutting, sewing, and trimming outside coverings; filling cushions; styling and designing; tufting and buttoning; and refinishing wood.

The CIP Code for Upholstery is 480303.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| HAND TOOLS | 9. Use hand tools.<br>- Webbing stretcher<br>- Scissors<br>- Tack hammer<br>- Screw driver<br>- Tack and staple remover<br>- Button machine |
| POWER TOOLS | 10. Use power tools.<br>- Pneumatic stapler<br>- Air rachet<br>- Screw gun<br>- Sewing machine<br>- Foam cutter<br>- Sabre saw |
| FOUNDATION AND BODY WORK | 11. Install springs.<br>- Non-sag<br>- Box |
| | 12. Reweb chair seat. |
| | 13. Clinch coil springs to webbing. |
| | 14. Attach burlap over springs. |
| | 15. Fasten spring edge wire. |

TRADE AND INDUSTRIAL EDUCATION

UPHOLSTERY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| FOUNDATION AND BODY WORK (continued) | 16. Attach edgeroll to wire edge. |
| | 17. Lay out platform cloth. |
| COVERING | 18. Attach an upholstered curved panel. |
| | 19. Attach tackboxing on sofa. |
| | 20. Blind stitch outside wings. |
| | 21. Blind tack outside arms. |
| | 22. Cover round arm. |
| | 23. Cut coverings.<br>- Arm<br>- Arm panels<br>- Seats<br>- Tight back |
| | 24. Lay out coverings.<br>- Arm<br>- Seat<br>- Tight back |
| | 25. Construct bolsters.<br>- Round<br>- Square<br>- Wedge |
| | 26. Sew coverings.<br>- Arm cover<br>- Chair seat boxing<br>- Seat cover |
| | 27. Upholster coverings.<br>- Arm<br>- Covered arm panel<br>- Pullover seat<br>- Tight back |

TRADE AND INDUSTRIAL EDUCATION

UPHOLSTERY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| **FRAME PREPARATION** | 28. Strip, refinish, and repair furniture. |
| | 29. Prepare and finish show wood. |
| **FINISHING AND TRIMMING** | 30. Cover units.<br>- Armrest<br>- Back window panels<br>- Convertible tops<br>- Dash panels<br>- Front back<br>- Kick panel<br>- Windlays |
| | 31. Install automotive interiors.<br>- Headliner<br>- Sun visors |
| | 32. Cover box pleats. |
| | 33. Cut materials.<br>- Double-welt strip<br>- Kick-pleat skirt<br>- Single-welt strip |
| | 34. Construct skirt pleats.<br>- Box<br>- Kick<br>- Shirred |
| | 35. Sew welt to skirt. |
| | 36. Cover buttons. |
| **CUSHIONING** | 37. Fill channels. |
| | 38. Attach channel to back frame. |
| | 39. Measure and chalk seat cushion. |

TRADE AND INDUSTRIAL EDUCATION

UPHOLSTERY

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| CUSHIONING (continued) | 40. Fasten buttons to cushions.<br>- Solid wood base<br>- Webbing and burlap foundation |
| | 41. Fill cushions.<br>- Dacron wrap<br>- Spring-filled |
| | 42. Make a loose cushion. |
| | 43. Sew a reversible cushion. |
| | 44. Set a zipper. |

TRADE AND INDUSTRIAL EDUCATION

WELDING

Welding provides specialized classroom and shop experiences in all types of metal welding, brazing, and cutting operations. Instruction emphasizes safety, electrode types, welding joints, welding symbols, blueprint reading, and electrical principles.

The CIP Code for Welding is 480508.

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| EMPLOYABILITY SKILLS | See pages 5-6, Outcomes 1-8. |
| WELDING BLUEPRINT READING | 9. Develop blueprint skills necessary to function with welding prints. |
| ELECTRODES | 10. Demonstrate a knowledge and usage of welding electrodes.<br>- Gas<br>- Gas metal arc<br>- Shielded metal arc<br>- Gas tungsten arc<br>- Flux cored arc |
| OXYACETYLENE WELDING | 11. Set up an oxyacetylene welding station.<br>12. Light and adjust the torch.<br>13. Carry a puddle.<br>- Without filler rod<br>- With filler rod<br>14. Construct welds in flat position.<br>- T-joint<br>- Lap joint<br>15. Weld beads in the vertical position.<br>16. Braze mild steel. |

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| **OXY-FUEL CUTTING** | 17. Lay out and manual cut.<br>- Straight lines<br>- Angles<br>- Circles<br>- Patterns<br>- Pipe<br>- Beams<br>- Angle iron<br>- Channel iron<br>- Square stock<br>- Round stock |
| | 18. Lay out and straight line burn. |
| | 19. Lay out and angular cut mild steel plates. |
| **SMAW-SHIELDING METAL ARC WELDING** | 20. Set up and adjust shielded metal arc welder. |
| | 21. Strike and maintain an arc. |
| | 22. Weld straight bead patterns. |
| | 23. Weld weave bead patterns. |
| | 24. Construct a fillet weld with 3/16" equal legs using a single pass in the flat position. |
| | 25. Construct a fillet weld with 1/4" equal legs using a single pass in the horizontal position. |
| | 26. Construct a fillet weld with 1/2" equal legs using three passes in the horizontal position. |
| | 27. Construct a lap joint weld with 3/8" equal legs using three passes. |

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| SMAW-SHIELDING METAL ARC WELDING (continued) | 28. Construct a square butt weld with 1/16" root opening in the flat position. |
| | 29. Construct a fillet weld using a single pass in the up position and a single pass in the down position. |
| | 30. Construct a V-groove weld using a multiple pass in the vertical position. |
| | 31. Construct a fillet weld using three passes in the horizontal position. |
| | 32. Construct a groove weld using a multiple pass.<br>- Flat position<br>- Horizontal position<br>- Vertical position<br>- Overhead position |
| | 33. Construct a groove weld on pipe in the flat axis position. |
| GAS TUNGSTEN ARC WELDING (TIG) | 34. Set up and adjust gas tungsten arc welder. |
| | 35. Construct a bead weld using a flat position with filler material. |
| | 36. Construct a 1/8" fillet weld using a lap and/or T-joint in a horizontal position. |
| | 37. Construct a 3/8" fillet weld using a lap and/or T-joint in a vertical-up position. |
| GMAW-GAS METAL ARC WELDING (MIG) | 38. Set up and shut down GMAW equipment. |

TRADE AND INDUSTRIAL EDUCATION

WELDING

| MODULES | STUDENT OUTCOMES |
|---|---|
| | Students will |
| GMAW-GAS METAL ARC WELDING (MIG) (continued) | 39. Construct a multiple pass T-joint fillet weld in the horizontal position. |
| | 40. Construct a lap-joint fillet weld in the vertical down position. |
| | 41. Construct a square-groove butt joint with short arc.<br>- Flat position<br>- Horizontal position |
| | 42. Construct a multiple pass T-joint fillet weld in the vertical up position with short arc. |
| | 43. Construct a corner joint fillet weld in the vertical up position with short arc. |
| | 44. Construct a square groove butt weld in the vertical up position with short arc. |
| | 45. Construct a T-joint fillet weld in the overhead position with short arc. |
| | 46. Construct a square groove butt weld in the overhead position with short arc. |
| | 47. Construct a single V-groove butt joint in the horizontal position with short arc. |
| | 48. Construct a single V-groove butt joint in the vertical up position with short arc. |

## COOPERATIVE TRAINING

Cooperative training is a teaching method used in some occupational preparation programs. It includes supervised, on-the-job training and related classroom instruction. Each cooperative student is supervised by a teacher-coordinator. Students attend classes part of the day and work in an approved work setting a minimum of three hours and a maximum of five hours per day. Together with the on-the-job training sponsor and the student, the teacher-coordinator develops a training agreement and an individualized training plan that identifies learning experiences designed to meet the student's occupational objective.

Written training agreements include:

(1) Provisions for the employment of student workers in conformity with federal, state, and local laws and regulations and in a manner not resulting in exploitation of student workers for private gain.

(2) Related occupational instruction in school.

(3) Payment of the prevailing wage for employment to student workers or reduced minimum wage approved by appropriate federal or state agency.

(4) School credit awarded for on-the-job training.

In the classroom, students receive instruction related to their on-the-job training experiences. The training plan outlines the sequential classroom instruction and on-the-job training a student is to receive. The training plan is the basis for evaluating the student's progress on the job and in the classroom. A minimum of 540 hours of on-the-job training is required for a student to meet the objectives of this program.

## VOCATIONAL STUDENT ORGANIZATIONS

Vocational Student Organizations (VSOs) provide a unique instructional method for attaining the student outcomes identified in each vocational program. The VSO activities are considered part of the instructional day as they are directly related to the competencies, goals, and objectives of the program.

Participation in any VSO provides students with various opportunities to:

Develop leadership skills.
Enhance vocational preparation.
Work together as a team.
Become productive citizens in a democracy.
Strengthen critical-thinking skills.
Facilitate and encourage personal development.
Develop human relations skills.
Gain recognition for accomplishments.
Develop decision-making skills.
Foster a respect for the dignity of work.
Develop skills for family and community living.

A Vocational Student Organization (VSO) is an integral part of each program area's curriculum. The following VSOs are approved by the Alabama Board of Education:

National FFA Organization (FFA)
Distributive Education Clubs of America (DECA)
Future Business Leaders of America (FBLA)
Health Occupations Students of America (HOSA)
Future Homemakers of America/Home Economics Related Occupations (FHA/HERO)
Technology Student Association (TSA)
Vocational Industrial Clubs of America (VICA)

All local VSOs are affiliated with the state and national associations and are supported by membership dues and fund-raising efforts. Any student enrolled in a vocational education course or program is eligible for membership in the vocational student organization associated with that program.